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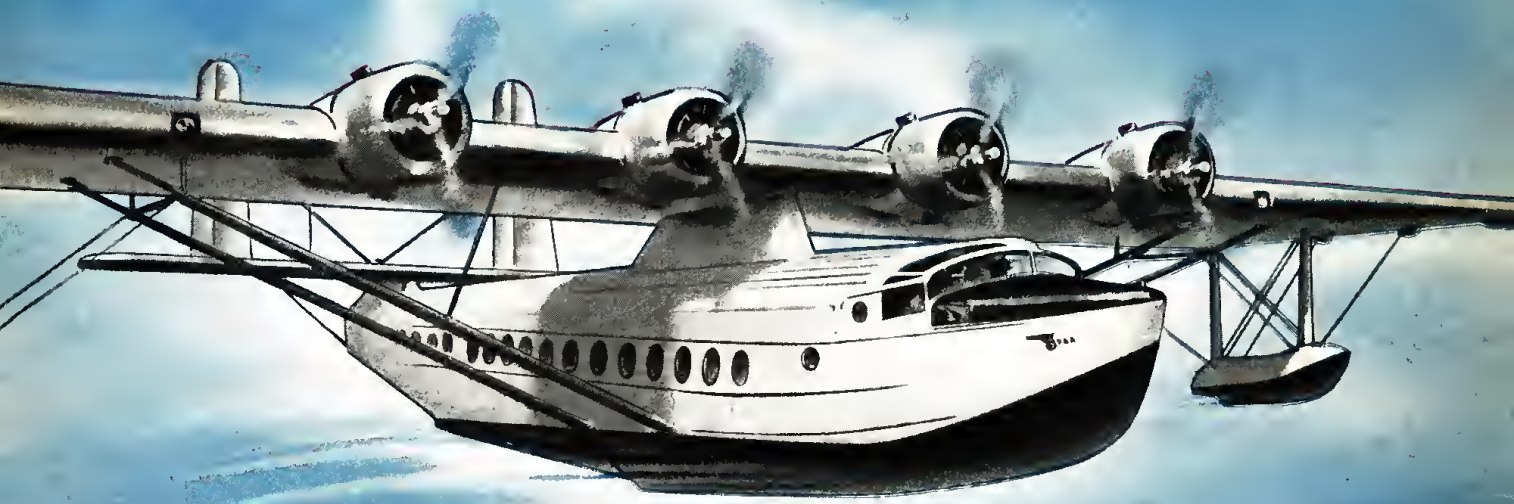
The Oldest American Aeronautical Magazine



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THE ATLANTIC

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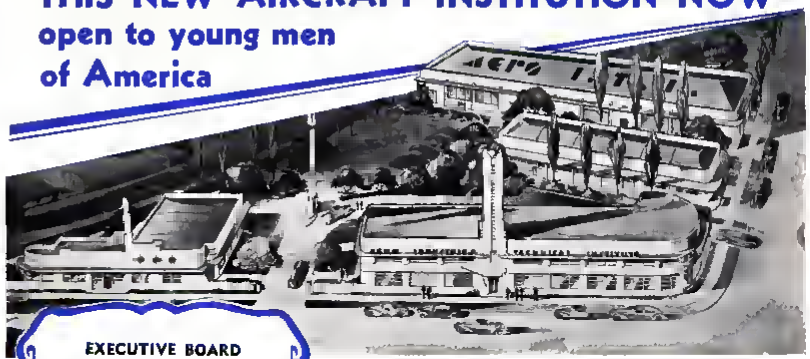

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Published monthly, price 35c a copy. Subscription rates—United States, Canada, Mexico and Central and South American Countries, $3.00 a year. All other countries, $5.00 a year or 24 shillings. Entered as second-class matter Sept. [illegible], 1935, at the Post Office, Albany, N. Y., under the Act of March 3, 1879. Volume 36, Number 8.

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Big airlines throughout the world find this true every day in their shops. In overhauling private ships, owners report the same thing.

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By means of tests like this Macwhyte has developed a cable that gives more hours of service—lower operating cost. Macwhyte "*Hi-Fatigue*" Aircraft Cable actually has the highest fatigue resistance ever built into an aircraft cable. Specified as standard equipment by leading manufacturers and airlines. Available either PREformed or non-preformed—tinned, galvanized and stainless steel.

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Made in accordance with A-N specifications to meet all tensile bending and salt spray requirements

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Ordered by U.S. ARMY AIR CORPS

On July 6, 1937 the War Department awarded a contract to the Curtiss Aeroplane Division of the Curtiss-Wright Corporation for 210 all-metal pursuit planes.

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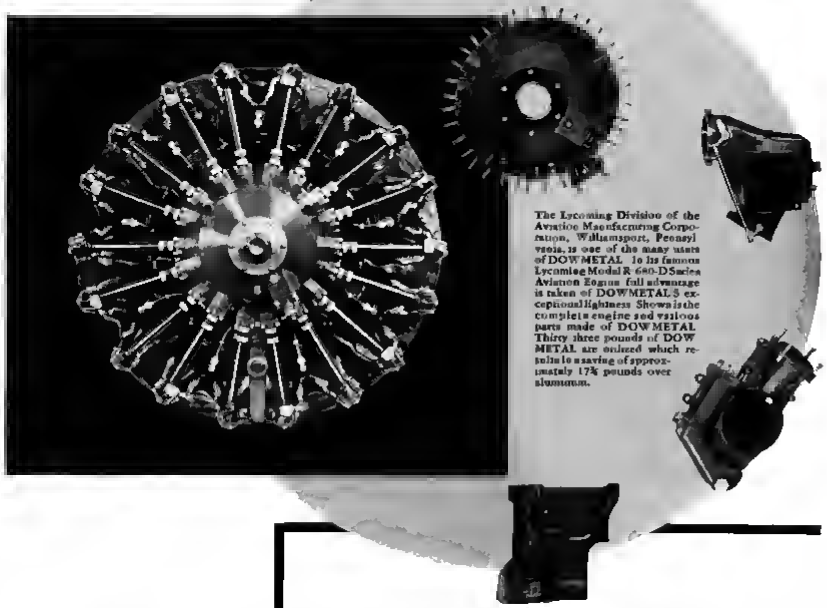
Current enthusiasm for DOWMETAL reflects the rapidly rising efforts of manufacturers to take full advantage of its *extreme lightness* — plus its ability to meet high-speed production requirements and competitive costs.



The Lycoming Division of the Aviation Manufacturing Corporation, Williamsport, Pennsylvania, is one of the many users of DOWMETAL. In its famous Lycoming Model R-680-D Series Aviation Engine full advantage is taken of DOWMETAL'S exceptional lightness. Shown is the complete engine and various parts made of DOWMETAL. Thirty three pounds of DOWMETAL are utilized which results in a saving of approximately 17¾ pounds over aluminum.

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DOWMETAL is providing this 'edge' for such products as aircraft engines, trucks and busses, electric vacuum cleaners, textile looms, wrapping machines, printing presses, typewriters and many others.

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FOR Factory and Maintenance Base:	Arc welders, electric furnaces, gears and pinions (heat treated and Micarta), instruments and meters, lighting, power generation and distribution, motors and control
FOR Research and Testing:	Instruments, dynamometers, dynamotors, heat treating equipment, noise analyzers, oscillographs, Stroboscope, motors and control

—Wherever you are, there is a Westinghouse Sales Office and Repair Shop nearby to serve you

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In the ceaseless quest for improved aviation equipment, many new and improved devices to assist the designer speed his progress have come from Westinghouse research and engineering laboratories. With equipment developed or perfected by Westinghouse you can see air currents, and make stresses in machinery or metal parts visible to the naked eye. Other Westinghouse products analyze noises, and "stop" the most rapidly moving part for inspection while in full motion.

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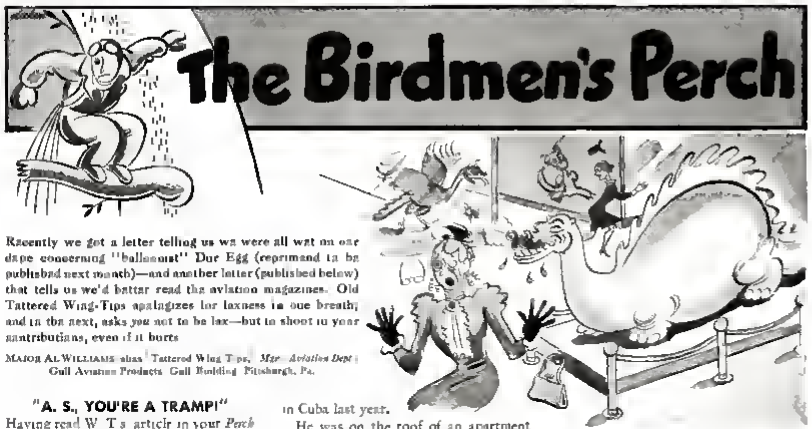

Recently we got a letter telling us we were all wet on our dope concerning "ballonist" Doc Egg (reprimand to be published next month)—and another letter (published below) that tells us we'd better read the aviation magazines. Old Tattered Wing-Tips apologizes for laxness in one breath; and in the next, asks you not to be lax—but to shoot in your contributions, even if it hurts

MAJOR AL WILLIAMS alias Tattered Wing Tips, *Mgr. Aviation Dept.*, Gulf Aviation Products, Gulf Building, Pittsburgh, Pa.

"A. S., YOU'RE A TRAMP!"

Having read W. T.'s article in your *Perch* (March, 1937) about the first flight being challenged, and in the next *Perch*, a lug, A. S., saying that W. T. was full of baloney, I would like to put my two cents into the matter, and tell you that the TRAMP who said those flights were not made, ought to wake up or learn how to read.

If it won't affect your pocket book, I might suggest that you spend two-bits and get the January, 1935, issue of *Popular Aviation*. Turn to page 22, and you will read of an aircraft pioneer, inventor and flier who built 56 airplanes before 1901 and made several successful flights.

His name was Gustave Whitehead of Bridgeport, Conn. If you can't get a copy of this issue, I'll be glad to let you have a "look-see" at mine.

Yours Aero-nut-icelly,
"Spud" Feingold, Montreal, Que.

P. S.—*Why not publish this letter and some more dope on Whitehead; as a the readers of your monthly blast can raise their hats to a brilliant man who deserves a great deal of credit!*

WANTED, ONE WHITE FLAG

A dashing birdman and newsreel cameraman race pretty near had his feathers plucked in Cuba last year.

He was on the roof of an apartment house, taking pictures of a street fight. Some of the fighters saw his camera peeping over the edge of the roof and thought it was a machine gun.

They blazed away at him, and it was just fool luck that he wasn't splashed all over the roof. He ran downstairs and surrendered pronto. And, believe me, he had to scatter plenty of Americano dollars around in order to leave in one piece.

—"Al" Borgan, New Jersey

TRUE STORY DEPT.

If you were to take samples of leading airplane oils *not refined by Gulf* to Port Arthur, Texas, and put them through Gulf's *Alchlor* process, you'd find this surprising fact:

Out of these oils would come a residue of black sticky waste—waste which only the Alchlor process can remove. That is why *Gulf Aerlene Oil*, the only Alchlor-processed oil for planes, is the best oil you can put in a ship.

FIRST U. S. AIR MAIL

January 9, 1793, Jeanne Pierre Blanchard took off from Philadelphia on the first balloon flight in the new world.

In his pocket was the first piece of American Air Mail, a letter from President George Washington to introduce him to whatever person he should chance to meet at the end of his daring trip.

—Y. S. B.

THIS MONTH'S WHOPPER

As an Assistant Curator of the Woggulu Museum, I must inform you that I am both indignant and perturbed over the outrageous performance of one of your products.

One of our most valued exhibits here at the museum is the original Wombat plane of 1903. You will recall that Aggie P. Wombat was the first woman to fly the Atlantic in a series of continuous loops, and for this feat was awarded a life pension of $750,000 a year by the Congress.

Last month, a visiting aviator bet one of our trustees that he could duplicate Miss Wombat's feat in the original plane, provided he could use Gulf Aviation Gas as the fuel. Unfortunately, the bet was accepted in a moment of what I can only describe as deplorable revelry.

A supply of Gulf Aviation Gas was opened for testing in our Large Mammals laboratory. I regret to say it was left accessible to all the larger mammals.

The next day, our biggest dinosaur but an elderly lady so that she was unable to sit down, four stuffed elephants broke out of their glass case and did the rhumba, and the brontosaurus and the pterodactyl could not be restrained from winking at the more comely visitors. To be vulgar, gentlemen, all hell broke loose.

As if anything more were needed, the aviator in the Aggie P. Wombat plane flew all the way to Hawaii doing outside loops around the China Clipper.

I must close, as an attendant has just told me the Curator has gotten into the gas and is now walking on the ceiling.

—Theodore "Honest Ted" Garrett

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AVIATION

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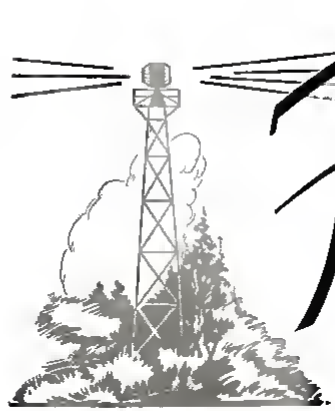

Flashes

From the Skyways of the World

» IT WON'T TAKE READERS OF THIS ISSUE LONG to figure out that we were at Elmira this month to see how the Soarers were getting on—and that we liked what we saw. We brought away a couple of cases of sunburn, and a couple of those funny, phoney sun helmets that always give Harris Hill the look of a gathering place for African explorers about to shove off on safari through trackless jungles.

Which reminds us of a comment we heard from one of the local citizenry, anent the passing by of a certain scientific gentleman from Langley Field whose handsome Van Dyk beard was well set off by his linen suit and white topee. "Geez," he said, "dat guy must be a *real* lion-hunter."

» AND THEN THERE WAS the somewhat bewildered old gentleman who pointed out to your editor a certain glider (in the "utility" class) and said he didn't see how the dern thing could possibly fly because it was all filled up inside with iron pipe.

» ONE DAY, while we were quietly munching a hot dog at the refreshment stand, an old lady who had been getting her tonsils well sunburned watching Dick duPont and Lew Barringer soaring round and round, high above the ridges, came over to ask the "Coke" Dispenser if it was really true that they couldn't get down from way up there. She went away somewhat reassured, but obviously still somewhat skeptical, when the CD carefully explained that the ships had rudders and other things and could come down anytime the pilots wanted to.

•

In This Issue

We resume our series of airline accomplishment with the story of TWA's method of flight and weather control. Our thanks to President Jack Frye and to Harris Hull of the New York office for their excellent cooperation. . . . Don Brimm, writer, teacher and seaplane pilot of long experience is with us again with the story of some tests made recently to improve seaplane take-off . . . John Walter Wood, architect and airport consultant, continues his series on airport design of which No. 1 appeared in the June issue. . . . AVIATION in the person of our popular West Coast Editor, Charles F. McReynolds went to a party at Monterey with a group of flying week-enders of Aviation Country Clubs of California. His story contains a lot of suggestions for anyone interested in flying for fun. . . . An account and some pictures of Elmira's latest Soaring contest. . . . Herbert V. Thaden, consulting engineer and well known figure in aviation, has evolved a method of evaluating the worth of the several types of equipment for airline service. . . . One of our radio advisers, Dao Fink of Electronics, discusses the most recent developments in the search for snow and rain static elimination. . . . A round-up piece on the trends in the design of very large aircraft by C. F. McReynolds.

» AFTER LEAVING ELMIRA we dropped down to Williamsport to see how Lycoming was getting on. George Brew and his staff took care of us in fine shape, showing us how they were getting out their quota of engines per month. Their propeller department looked very busy, too.

» TOOK TIME OUT while at Williamsport to run over to Lock Haven (25 miles away) to visit Taylor Aircraft in its new factory. They moved away from Bradford on July 1. (You remember they had a fire there last spring which completely destroyed the old plant and forced them into temporary quarters for the last couple of months.) Ted Weld and Arthur Pierce showed us about the place. Considering that machinery and materials were still being moved in, they were doing quite well. Long before this issue goes to press the Cubs will be rolling off the new production line.

» ON THE LONG DRIVE from Williamsport back to New York, we had the pleasure of carrying Engineer Hans Bohringer of the propeller department of Junkers at Dessau (Germany). He is here to see something of American production methods. We were glad to be able to give Herr Bohringer a lift, for in a small measure it helped us repay some of the many courtesies that were extended to us by the Junkers people at Dessau last November.

BUILDERS OF DEPENDABLE AIRCRAFT SINCE 1909

THE GLENN L. MARTIN COMPANY BALTIMORE, MARYLAND, U. S. A.

TRADE MARTIN USA MARK

» When the Explorers Club, (with a number of other organizations including the Institute of the Aeronautical Sciences) threw a big dinner at New York's Waldorf not long ago for the *three* U S S R pilots who flew over the North Pole last month, only *two* put in an appearance. Their colleague, unaccustomed to the way America greets and treats its heroes of the hour, had been so exhausted by the continuous series of lunches, dinners, teas and cocktail parties, that he had to lay up temporarily for repairs. The fact that two of the three were still on their feet by the time they reached New York only proves again that our Russian cousins are a very hardy folk.

» On a recent visit to Sidney, N. Y., we found aviation's most perfect host in Tom Fagan of Scintilla. Tom took us through the new and busy plant and for a two hour exploration tour of the nearby country in his new Lincoln Zephyr, and we came away with a fresher realization of what Scintilla is doing not only for the aviation industry but for Sidney. A rifle club and a neat little airport are among the recreational facilities sponsored by the company for its employees. And last but not least the plant now employs over 900 people, a record far surpassing 1929, providing work for more than one-third of the population of Sidney.

» Up in Rochester we found Airport Manager Howard Shafer rushing around directing a group of W P A workers who were breaking ground for a large and much needed hangar. The airport has grown rapidly since our last visit and Howard has a lot of well thought out plans for further expansion. Rochester is fortunate in having one of the most able men in the business directing its airport development.

"Maguire's using his hole as a radio compass!"

» Note for the vital statistics department: "Olive Ann and Walter H. Beech announce the arrival of Suzanne Mellor Beech, a 7 lb 7¼ oz Streamlined Model, Refined and Improved for 1937." Inside a folder accompanying this announcement was a blue print and some detailed specs, including 'weight empty, 7 lb," and 'retractable undercarriage." Congratulations, Mr and Mrs Beech!

» One pitch black rainy night recently a watchman was hired to look after a couple of ships parked out doors on New York's North Beach Airport. He had one of those portable time clocks carried by a strap over the shoulder. One of the field officials, not knowing of this arrangement peered out of the window of his shack, saw the watchman make his way through the dripping darkness to the first airplane, punch his clock, proceed to the second plane and repeat the performance. 'Gosh!" he said, 'What a hell of a night for anybody to be out there taking pictures!"

» Value of the airplane in emergency criminal work was again demonstrated on June 28 when Walter Burdette, veteran Los Angeles pilot, was pressed into service by Inglewood police in the search for the three child victims of Inglewood's kidnap-killer. Burdette, circling low over the Baldwin hills, was first to sight the bodies of the victims for which hundreds of men had unsuccessfully searched for two days. Hidden in a narrow ravine which had defied efforts of ground searchers they were easily spotted from the air.

» A unique "Fly-Ur-Car" service has been inaugurated at San Diego, Cal., by Western Air Express for the benefit of passengers wishing to rent a car for twenty-four to forty-eight hours for motor jaunts into Old Mexico. Private cars are maintained at the airport and passengers alighting from the transport planes may step at once into an automobile which is available at standard low rental rates. Just another airline convenience.

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With virtually mathematical certainty, the action of an airplane's landing-gear during those all-important moments of ground contact, can be predicted . . . when Bendix Pneudraulic Shock Struts, Wheels and Brakes are underneath. They cushion the impact shocks of landing, absorb the lesser bumps of taxi-ing and provide sure and smooth deceleration. They are strong, reliable, and as light as is consistent with sound engineering

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AIRPLANE WHEELS • BRAKES • PILOT SEATS • PNEUDRAULIC SHOCK STRUTS

Side Slips

By
ROBERT OSBORN

» WE SEE BY THE PAPERS that the rip-cord boys have formed a union called The National Association of Parachute Jumpers and are demanding not less than $25 for each jump. In spite of this demand we are sure that both union and non union members are going to do their best to avoid sit-down strikes

» THE SANDBOXES IN THE PLAYGROUND IN MOSCOW are now being equipped with small parachute jumping towers so that the children can make 14 ft. practice jumps. Apparently the Russian high command thinks that a knowledge of mud pies and sand forts isn't going to be of much value in the next war

» IF WE ARE TO BELIEVE THEIR ADVERTISING, one of the large cigarette manufacturing companies should be considered by the Collier Trophy Committee for their annual award. In recent months we have learned that "America's Number One Test Pilot", "The Lady Glider Champion", "The Ace Transport Pilot" and "The Official Parachute Tester" all would be unable to get along without this particular brand of cigarettes. If we see a few more testimonials like this, it might be advisable for Congress to apply the restrictions of the Neutrality Act to the export of these cigarettes to nations at war—which would probably result in immediate grounding of their entire air forces.

» A NEWS ITEM states that the adopted daughter of President Kamal Attaturk of Turkey has been awarded a diamond studded medal for her flying activities, and that she will be appointed training pilot for a group of "Flying Amazons" to be incorporated into the Turkish Air Force.

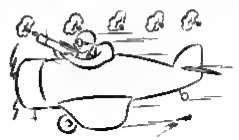
As women are notoriously bad shots with everything from golf balls to automobiles we can't see why they should be any better with machine guns—therefore we shouldn't expect any increased number of casualties in a war due to the innovation of lady military pilots. However, there will probably be an amazing number of bent fenders and broken bumpers on the airplanes, and if one of the Flying Amazons should hold out her hand to signal for a turn, we'll bet that the sky would be cleared in very short order of friend and foe alike.

» SOME NEW YORK ARCHITECTS are exhibiting models of the buildings of the future, which they say will be "built of glass and shaped like airplane propellers."

Of course if these buildings are to completely follow modern aerodynamic science they must also be full-feathering and have a constant-speed control for rotating with the sun. Also, we'd suggest that the buildings be tested for 150 hours for blade vibrations and for torsional crankshaft oscillations in the subway below street level.

» NOW that Messrs Wheatly, Rogers, Archbold et al have demonstrated that a Consolidated flying boat can be flown 2 600 miles across land without difficulty we suppose the company will be fitting out other models of that boat for forestry patrol, or for mapping the "dust bowl."

» AIRPLANE MANUFACTURERS are always willing to give out remarkable performance data for their products, and with the incentive of competition from other manufacturers their claims sometimes approach the miraculous. The *Philadelphia Record* recently printed a picture of an Army attack ship with the caption 'Almost as fast as the bullets from its guns."



Any day now we can expect some other manufacturer to complain that the structure is being damaged and the crew endangered by the bullets as his ship overtakes them.

» IN PHILADELPHIA a strike has been called at a glider factory by the members of the United Bedding and Ghder Workers Union.

The workers in Philadelphia must be gifted with many talents as this recalls a sign we noticed

"Joe Doakes, Tin Roofing and Ice Cream Cones'

Soaring Soaring

IF WE WENT TO ELMIRA with nothing more in the way of expectations than the usual pleasant two or three days on Harris Hill and the equally pleasant round table "bickering" at Rhodes' farmhouse or in the air-cooled inner reaches of the Mark Twain, we came away without being disappointed. But we brought back a great deal more than pleasant memories. We came back full of renewed enthusiasm for motorless flying, for what we saw convinced us that Soaring as an American sport has definitely turned the corner.

For the past several years the going has been far from smooth. It required more-than-average interest to build or to buy a machine and to make the long trek to Elmira each year in the hopes of getting in a few flights for a little local glory and for a (very) little in prize money to underwrite the project. Once at the soaring sites it was a toss-up whether or not the weather or the inadequate launching facilities would guarantee any flying at all. At best, one could look forward to a fairly spectacular showing by a small group of wealthy sportsmen with one or two high priced, imported soaring machines, plus a more or less hit-or-miss program of down-hill gliding by groups of impecunious but earnest young men. It speaks well for the efforts of the late Warren Eaton, of Ralph Barnaby, of Karl Lange and the other officials of the Soaring Society that interest was maintained in the face of so many discouragements.

Now, things have taken a decided turn for the better. Three major factors are responsible.

(a) The facilities and the equipment on Harris Hill have been tremendously improved. Thanks to the efforts of the Soaring Society cooperating with Elmira's Association of Commerce, the WPA and the CCC, permanent buildings have been installed to house the meteorological and radio services, the press, meet headquarters, the pilots and their machines,—not to mention the visiting public. The field itself has also been graded

and improved and further work is in prospect.

(b) The former feeling that winch tow-offs were dangerous and impractical has been broken down completely. The crude home-made winch equipment which first reared its ugly head in the last year or so has given way to smooth and efficient and very professional looking machinery which permits towing-off in any direction and to any altitude up to about 1500 feet.

(c) The posting of adequate prize money for new design, and the use of the point scoring method in competition has given a real boost to the development of new soaring machines in this country. This year half a dozen U.S. designs appeared to dispute honors with the machines from abroad (see page 36), and the prospects are that more than a few will put in an appearance when next year's meet opens.

Besides, the new activities of the Soaring Society with Lew Barringer at the controls have already done much to foster interest all over the United States. The new rules for competition, although at first sight working hardship on some of the smaller fry, have already shown that they make good sense, and have been accepted as a real forward step in the conduct of meets, and in the establishment of new records.

But the several accidents that marred the meet and the final holocaust in which three of the best ships on the field were wrecked by the misguided efforts of a secondary contestant, points toward a need for more drastic regulation for the future. Not only must the qualifications of machines and pilots be morely closely checked, but better methods of traffic and parking control near the landing areas are imperative.

By and large, we are convinced that American Soaring is at last off on the right foot, that competition and interest can be developed comparable to yachting in all classes, from "Star' to the ultimate "J". Our only regret at the moment is that Warren Eaton cannot still be with us to see what changes his enthusiastic example has wrought.

A. E.

WE HAVE PUT OFF writing this editorial as long as possible, hoping against hope that some news would come out of the Pacific of the rescue of Amelia Earhart and her navigator, Fred Noonan. But since the last contact when they were still in the air, not a single message of undisputed authenticity has come through from them, nor have any of the searching squadrons reported a single clue. There is still hope that by some miraculous chance they may still be afloat or stranded on some atoll without means of communication. But, failing that, we must come to the reluctant conclusion that they went down with their ship somewhere near Howland Island.

American aviation sustains a real loss with the passing of Amelia Earhart. Next to Lindbergh, she exemplified in the public mind the spirit of the era of single-handed achievement in aviation through which we have just passed. Of her courage and competence there is no question. She combined native capacity for quick decision and direct action with feminine charm and personality. She really did like to fly for "the fun of it," and on that score her actual and potential contributions to aviation were great.

But her greatest weakness was her extreme consciousness that she was a woman. Obvious in all her activities, since she rode as "a sack of ballast" across the Atlantic in the Friendship in 1928, was the constant drive to undertake difficult things just to prove that she (as a woman) could do them. It is not difficult to see that such an urge might sooner or later lead her into trouble.

We have made no bones of the fact that we believe the time long since past for great solo achievement in aviation. Today is the day of the carefully planned, scientifically backed, group development. Our greatest regret is that Miss Earhart chose this time for her last venture. At most it would have contributed little or nothing to the knowledge of commercial ocean flying that is now the most important field for the future.

The real tragedy of Amelia Earhart is that hers was the psychology of the Age of the Vikings applied at a time when aviation had already passed over into the Age of the Clipper.

Over the Pole

ONCE OVER THE POLE and into the United States by the Canadian route,—a splendid enough achievement, but one that might reasonably be discounted somewhat on the ground of good luck.

Twice over the Pole and into the United States by the Canadian route, and, at the same time, pushing the world's long distance record well above the former figure,—that's something else again! Clearly in carrying forward the U.S.S.R. polar program "the slings and arrows of outrageous fortune" are being fended off by careful planning, courageous piloting, and competent engineering and manufacturing.

Although we cannot see any immediate commercial or military significance in the Russian flights as far as the United States is concerned, they will certainly stand out in the annals of aviation. We can easily imagine two direct results, however, of international significance. The first, a great uprush of an already colossal interest in aviation throughout the Soviet Union, and the second (not unrelated to the first), a considerable uneasy squirming about among military people in certain capitals of the world.

Whatever they may mean ultimately, however, the flights themselves were well executed and deserving of the congratulations of the entire aviation world.

Camera's Eye on the News

1.

2.

3

1—The Navy's newest aircraft carrier, Yorktown, puts to sea off the Virginia Capes for her builder's trials. She reached 32½ knots. (Wide World)

2—Before disaster: Amelia Earhart and Fred Noonan talk with Standard Oil's Viscount Sibour at Karachi, India. (Wide World)

3—A flying-boat overland. Richard Archbold waves from the bow of 'Guba,' the Consolidated boat in which he flew from San Diego to New York. It will be used for an American Museum expedition into New Guinea. (Rudy Arnold)

4

4—Vancouver Barracks, Washington, plays audeo host to visitors from Moscow. The first Russian polar fliers and their plane, the ANT-25. (Wide World & Frank L. Jones)

FLYING...

Pete Redpath, Tommy Tomlinson and Hal Snead, study the weather maps for a survey flight.

with one foot on the ground

TWA 's flight plan and dispatch system makes possible a paradox

ONCE UPON A TIME (back in the days when this aviation business hadn't yet lived down the fact that it really was a "war baby") there were Two Pilots. One was an up-and-coming Young Fellow who had ideas, and used his Head for something more than to keep his Ear muffs apart. The other was an Old Timer who had been through the Mill and who knew all the Answers. Both worked for the same airline.

Now it came to pass that on a certain day both were taking ships into Chicago, two sections of the same schedule. The weather at Chicago was, in the quaint *patois* of the period, distinctly "lousy"—and gave every evidence of becoming more so. But the boys who turn the weather on and off said that it was okay, so—Trip 13, both halves of it, presently pushed off in the prescribed manner.

Before departure, however, Pilot A (he of the Ideas) gathered together all available predictions of the Meteorological Soothsayers and went into a huddle with himself. He studied the strange and curious Symbols that they are wont to use (perhaps to conceal of the workings of their magic from the Yeomanry) and came to Certain Conclusions, to wit:

a. He would either be able to land at Chicago, or he wouldn't.

b. If he couldn't land at Chicago, he would have to land somewhere else.

c. The "somewhere else" would probably be one of twa airports to the West of Chicago that would certainly stay open longer than Chicago.

d. To make them comfortably, he would have to go easy on his fuel on the way out.

Having signified his intentions to the Gods in the Dispatch Office, he took off.

Pilot B, on the other hand, glanced over the Works of the Weather Prophets, and cast them aside. If Chicago was okay with them, it was okay by him. He had been there before (several hundred times in fact) and he would get in all right. If he couldn't, well—time enough to worry about that when he got there. With a final twist to his Waxed Mustache and a wave of the hand to the Bystanders on the Tarmac, he sallied forth, strapped on his Airplane and thundered off into the Sunset.

In due course both pilots arrived over Chicago. Things there had taken a decided turn for the worse. Pilot A was not particularly surprised nor perturbed. He knew exactly what he was going to do under the circumstances. He made one attempt to get in under the ceiling, then seeing that it was impossible, he pulled up through and headed westward for the field of his choice. Having nursed his engines carefully all the way out, he knew that he had plenty of gas left to make it with the prescribed limit to spare. He radioed ahead to the field, arranged for transportation for his passengers and when he came in for a perfectly normal landing under reasonably good conditions, everything was in order. His passengers had nothing but praise for the way in which the whole performance had been carried off.

Now B, on the other hand, was having himself a time. He had figured that he would push ahead to Chicago and be able to sneak in under the weather. The latter, however, had beaten him to it. He found himself cut off from the ground with fuel tanks getting dangerously dry. He flew around for as long as he dared, began looking about for any opening in the clouds below. Luck was with him, he found a hole and landed at an emergency field.

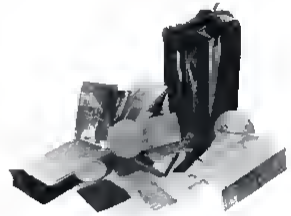
But the fact that Pilot B got his plane and passengers safely to the ground was not the really fortunate part of the whole incident. The matter came to the attention of Jack Frye, TWA President who for several weeks had been surveying operations records of other lines as well as his own. He saw instantly that there was more than a germ of an idea in Pilot A's careful preparation and procedure. Frye made up his mind then and there that no pilot in the future would take off with a load of passengers without knowing exactly how he was going to get to his destination and what he would do if that destination was unavailable. Thus was born TWA's Flight Plan.

Once the idea was launched, no time was lost in putting it into execution. R. P. (Pete) Redpath, pilot of long experience, and an expert navigator, was brought into Kansas City and set to work organizing a flight control and navigation department. He and other operating people studied the problem, made out dozens of trial forms and finally evolved TWA's flight plan as it stands today. They also developed a very elaborate kit now carried by each pilot, which contains all the information in the way of charts, graphs and tables, covering the route over which he is flying, plus flight computers, slide rule and other instruments necessary for navigation.

Before flight each pilot is required to consult with the dispatchers and weather bureau and to fill out his flight plan. He takes into account winds aloft and on the ground, the actual weather conditions on the route and the changes in weather that may be expected before completion of his flight. He decides and records the altitude at which he shall fly, the time it will take him to climb to cruising altitude and the time to get back to his terminal station without exceeding the rate of descent considered proper for passenger comfort. Most important he computes the fuel used under all conditions of the flight and calculates the fuel which he expects to have on board at various check points along his route and at his destination. He also designates the airports that will be used as alternates in case his destination closes in and furthermore states where he will go in case of a total radio failure.

All of these items are entered before he takes off. During flight and after arrival at destination, he enters in parallel columns the actual conditions encountered and the actual performance made good.

(*Turn to page 72*)



The kit which every TWA pilot carries in flight.

President Jack Frye (right) and Vice-President Paul Richter are airline pilots of long experience.

Back in the days when— Left to right, Paul Richter, Tommy Tomlinson, Jack Frye and Walt Hamilton, as they were fifteen years ago.

An Outline of Airport Requirements

The second of three articles on airport planning

By John Walter Wood

In the June issue of AVIATION we outlined the existing conditions at a number of our terminal airports, and gave some indication of some of the problems in airport planning that demand immediate solution. Below is a broad outline of some of the more important requirements for an ideal airport layout. Such an outline might constitute a basic standard against which any airport planning or design project might be measured.

The airport master plan (a plan which should be drawn up at the outset since it forms the backbone of the whole airport program and largely governs the effectiveness of the capital to be invested) should provide for the maximum traffic density on the fully expanded airport. Such a master plan should be sufficiently flexible as to insure the orderly development of the whole airport layout, including the airport buildings, making unnecessary the demolition or the moving of any of the original airport facilities in realizing the maximum airport expansion.

Certain trends in present-day air transportation have, of course, a very definite influence on airport design. In the first place, the volume of plane traffic, number of passengers, pounds of mail, freight, and express carried shows a very marked and steady increase (for a statistical study of rates on increases see AVIATION, April, 1937, pages 76 to 79). Also present-day commercial transport design is tending toward increasing plane dimensions, gross weight, wing loading and speed. At the present time, we are looking forward to landing large aircraft on airports under all sorts of weather conditions. Facilities are in sight that will make blind landings a more or less regular feature of air transport operation. These trends must be considered in laying down any project.

The following outline of ideal requirements for an airport layout is presented as a guide towards which, local conditions permitting, the airport layout may be approximated.

I. Airport Landing Area

1. Traffic Circulation. A simple well ordered system of plane circulation should be provided for plane operation from the time a transport plane lands, taxis to the loading point, is serviced and taxis to the end of the runway to take off.

2. Elimination of Cross Circulation. Thus regulated and systematic circulation of plane traffic on the airport should entirely eliminate the cross circulation of planes on the landing area, to speed up traffic and limit the possibility of traffic congestion and collision.

3. Runway Layout. All-over-surfaced airport landing areas are not likely to become general at commercial airports until improved methods of airport surfacing are devised which possess lower initial and lower maintenance costs and greater qualities of permanence than any method in use today. For efficient airport operation a rapid clearing of the landing area of arriving and departing planes is necessary. To effect a smooth and constant flow of traffic on the limited area of an airport a runway layout should be devised to provide:

a. Free Runways. The runway layout should make it unnecessary for planes at any time to taxi across runways.

b. Reduction of Plane Taxiing. The runway layout should provide for the landing of planes generally toward the loading points, thereby saving time, fuel and the unnecessary wear on planes, and it should not be necessary for planes to taxi around the end of runways to reach the loading points.

c. Economical use of Airport Area. The runway layout, while providing for the full flight requirements necessary, should not block off and isolate large portions of the airport into virtual useless and unusable areas.

d. Large Free Areas Adjacent Loading Points. Large and unrestricted areas adjacent the loading points should be provided for the free maneuvering of transport planes, comprising in number the maximum traffic density of the airport consistent with safety, without interference of planes at the loading point with each other or with planes landing and taking off.

e. Simultaneous Plane Landings and Take-offs. Parallel runways or runways sufficiently wide should provide for simultaneous landings and take-offs.

II. Plane Loading Platforms

1. Should be centrally located with respect to airway station to hangars and to the entire airport.

2. Should reduce the amount of maneuvering of planes at the loading point to a minimum.

3. Should provide for the arrival and departure of each plane to the loading point independently of the movement of other planes.

4. Should provide for the independent loading and unloading of numbers of planes simultaneously with provision for increased capacity for future requirements.

5. Should provide a separation of incoming and outgoing passenger and freight traffic.

6. Should facilitate passenger transfer between planes.

7. Should provide protection to passengers from the weather, from the blast of the airplane slip stream and from the roar of airplane motors.

III. Airport Buildings

Just as the airport acts as a "bottle neck" to air transportation so the plane loading platform acts as a "bottleneck" to the airport. If a well conceived traffic circulation and a systematic method for unloading is not devised, traffic congestion will start at the loading points and spread to all other portions of the airport.

1. Unity. Airport buildings should be centrally located with respect to the entire airport and to the runways and should be located on a relatively narrow airport frontage consistent with sound flight requirements and adequate spacing of buildings.

a. To make possible a smooth circulation of airport surface and air traffic.

b. To facilitate unified airport control.

c. To reduce the distance to be covered between most distant airport buildings.

d. To provide free air approaches to that airport boundary along which the airport buildings are situated.

2. Airway Station.

a. Location. The airway station should be centrally situated with respect to other airport buildings and should be in a key position in regard to runways and should be placed on the airport so as to permit the widest possible angle of approach for taxiing planes.

b. Expansion. The airway station should be designed from the outset for greatly increased passenger and freight accommodation and so planned that this expansion may be realized from the smaller initial station by well ordered stages to the ultimate expanded station without the necessity for costly demolition of the initial facilities.

c. Traffic separation. The station plan should provide for a separation of outgoing and incoming passenger and freight traffic.

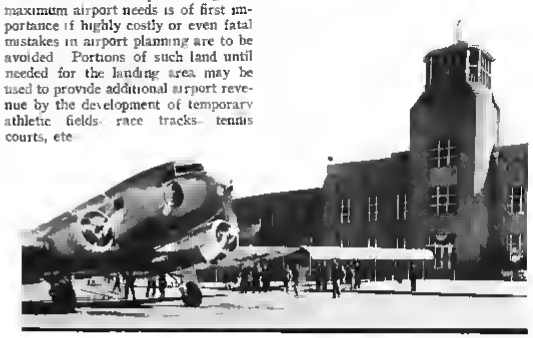
3. Hangars.

a. Location. Hangars should be centrally located with respect to the runway layout in order to provide for smooth plane traffic circulation and should be situated on a relatively narrow airport frontage yet sufficiently spaced from each other as not to limit the free movement of larger planes than any yet built.

b. Expansion. From the outset a hangar plane should provide for an expansion of the plane storage area and for increase in the clear door heights to provide accommodation for increase in plane span and plane height. The tendency today is to build a few large hangars with large hanger openings rather than a quantity of smaller hangars with more limited dimensions of hangar openings. Undoubtedly in the future hangars will be used principally for maintenance while the larger planes with motors suitably protected from the elements will be stored in the open.

IV. Airport Owned Land

1. Reservation. From the outset reservation of sufficient airport acreage for maximum airport needs is of first importance if highly costly or even fatal mistakes in airport planning are to be avoided. Portions of such land until needed for the landing area may be used to provide additional airport revenue by the development of temporary athletic fields, race tracks, tennis courts, etc.



2. Extent. The tendency today is to increase airport dimensions. Cf. The commercial airports Newark, Chicago, Paris, Berlin and other airports with heavy traffic. Exclusive of airport marginal areas the airport owned land should comprise at least 640 acres, one square mile, if provision is to be made for ultimate airport development. Many important airports already own land in excess of this amount.

Among the factors tending to increase landing area dimensions are: 1. Increasing volume of traffic. 2. Instrument (blind) landings. 3. Increase in plane size, wing loadings and speed of take off. Among limiting factors are: 1. Aircraft retarding devices. 2. Possible use of catapults for commercial operation. 3. Probable increase in plane maneuverability, perhaps to include vertical landings and take-offs. Following such latter developments the great increase in the number of aircraft would most probably more than offset any need to decrease the size of the airport.

3. Zoning. Control over the marginal areas of an airport to enforce the zoning regulations governing flight obstruction is an important consideration; ownership of such areas in which city parks could be developed would help solve individual problems.

V. Automobile Parking

Suitable provision for a free flow of automobile traffic must be made and ample car parking facilities provided, centrally located with respect to the airport buildings.

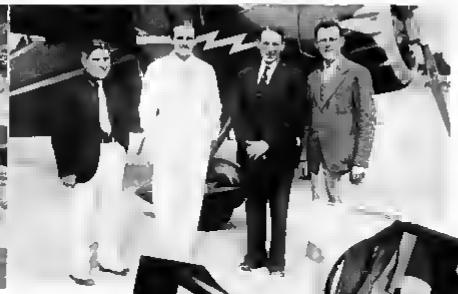
In a subsequent issue Mr. Wood will discuss a specific airport design based on the outline presented here.

Left to right: Mark Tyson, Mrs. Mark Tyson, Mrs. Dana Beller, Mr. Dana Beller.

Left to right: Bud Coward of Los Angeles, T. Magner, and Marshall Seaq ave., both of San Francisco.

Among the golfers (left to right) A. Lee Moore of Phoenix, Ken Holland and Mrs. Holland, and John Fulton.

Left to right: Ted Brown, Miss Georgia Lerch, Mr. and Mrs. Ed Van Dorn and Mr. Walter Ryberg.



Above—Some of the Aviation Country Clubs of California officials: (left to right) Norman Larson, chairman of air tour committee, Wally Timm, treasurer, Jerry Fairbanks, vice president, Bertrand Rhine, secretary.

Above, right—Left to right: Robert Croll, president, Monterey Junior Chamber of Commerce, Dana Beller, Winner Jessalyn Emmet G. McMeommin, Mayor of Monterey.

Bud Coward, stakes out his Waco for the night.

O. D. McKenzie

G. E. Buckstell.

Earl B. Gilmore.

Dana Beller at 6,000 ft. over Bakersfield.

Some of the ships on the line at Del Monte.

Mrs. Dana Beller

Among the horseback riders were Captain O. D. McKenzie, Mrs. Elliotte Roberts, Bertrand Rhine, Al Essig.

AVIATION *Goes to a Party!*

Photographs by AVIATION

BECAUSE IT IS OFF THE MAIN HIGHWAY and has no through rail or bus service, Monterey Peninsulas enjoy comparative isolation. Los Angeles is a full day's journey to the Southeast, San Francisco is a good 70 miles away. But, on a certain sunny Saturday afternoon not long since, its splendid isolation broke down before an invasion in the most modern manner. A plane appeared over the Coastal Sierras, circled, glided into stop on Monterey's hillside airport. Others followed, from Los Angeles, from nearby San Francisco, from far away Phoenix, until 53 ships were staked out on the line and 160-odd aerial week-enders had packed their luggage over to swank Hotel Del Monte. From then on it was everybody's party. While contest committees checked log books for the day's flight winner, the rest of the skyriding tourists donned swimming suits or riding habits, or teamed up for golf, tennis and badminton.

A new destination, but an old and delightfully familiar show for members of Aviation Country Clubs of California. Four times before they had flown away from desks and domestic duties on weekend aerial jaunts: once up into Death Valley, once down to moun-

(*Turn to page 75*)

Miss Lois Boardmann, Private Pilot from Phoenix.

Advance Against

SNOW STATIC

UAL Flying Laboratory crew, under H. M. Hucke, disproves old theory of snow static production, advances a new one. Trailing discharge wire gives improved reception through static

H. M. Hucke, engineer in charge of the UAL expedition, demonstrates a static measuring device used for automatic recording

By Donald G. Fink
Managing Editor, Electronics

EARLY LAST SPRING United Air Lines dispatched its flying laboratory on an expedition, for the exclusive purpose of studying static interference with radio reception "Particle static", that type associated with snow, rain, and dust, was to be 'brought home alive," if possible, by a crew of ten men, including physicists prom Purdne, Reed College and Oregon State, engineers from the Bell Labs and the Bendix Corporation, and UAL men, headed by H M Hncke, who was in charge of the program. The Pacific Northwest was chosen as the locale of the study, because the desired types of atmospheric conditions are present there a large percentage of the time.

The program included correlation between static conditions and weather phenomena, which data may be used as a basis for forecasting static conditions and for the development of a working theory of static prodnction to be used for improved antenna construction and for devices intended to rednce the canse of static at the source The static-weather correlation data were taken on automatic recorders which preserved a record of the static level along with the corresponding temperature and pressure changes This mass of information is now being deciphered by UAL meteorologists, it is too early to predict the outcome, bnt the hope is that static may definitely be tied np with the motion of "fronts" and other aspects of air mass analysis, which would make prediction of static conditions feasible.

Inside the test plane, on the bench at the left, are automatic high-speed recorders for correlating static level with changing conditions

One immediate result of the study is the development of a static dissipator in the form of a trailing wire which not only improves reception but has gone far toward proving a new theory of static formation It has been supposed for some time that the chief cause of static was the transfer of electric charge from the particles of snow rain or dust to the plane as they hit the snrfaces of the ship The experience of the UAL group gave evidence that this was not the case, rather it was thought that the charge was accumulated by the plane and then discharged from the trailing edges of the wings and tail surfaces Assuming that this latter discharge caused the static the most favorable location for the receiving antenna should be forward as far as possible Comparative tests with different antenna locations showed that the forward location was the best.

To prove further that trailing discharges were to blame the ship was flown to Oakland, and jacked np on high voltage insulators in the UAL hangar A 100,000 volt generator was then connected to the structure, and the plane charged to that voltage, artificially, thus simulating conditions in the air except that no airstream effects were present It was found that the static level was very high, but that the position of the antenna used made little or no difference The conclusion was that the static discharge ordinarily leaves from any sharp point, but that in flight the pressure of the air flow causes the discharge to take place at the trailing edges

Having fonnd that a forward position was best for the antenna, the next step was to confine the discharge as far aft as possible. This was accomplished by trailing a heavy wire from the tail some 50 feet long and suspending from this wire another long length of very fine wire from which the discharge takes place Between the snpport wire and the fine discharge wire is a suppressor resistor, of the type used on spark plngs to reduce ignition static This suppressor acts as a one-way resistance allowing the steady flow of charge to reach the fine wire but preventing the oscillating current (which results from the actual discharge) from re-entering the support wire. By this device the major part of the discharge is caused to occur nearly 100 feet behind the plane, and the receiving antenna, near the nose, is thus far removed from the source of the noise In severe static conditions, several trailing discharge wires may be used, from the tail and at intervals along the wings At present the economic balance between aerodynamic drag caused by the wires on the one hand and the improvement in reception on the other is being evaluated. Another problem is that of obtaining sufficient strength in the fine wire to prevent its being whipped off the end of the snpport wire

The expedition has also been actively experimenting with improvements in the housing and shielding of directional loop antennas The shielding of a loop has been known to improve the signal level, relative to the static, provided that the static level is not too high By the use both of the shielded loop in a proper stream lined housing (which also must be specially treated to reduce charge accumulations) and the trailing wire, two avenues of approach are available, and they appear to supplement one another-

By D. J. Brimm Jr.

Helping the Seaplane Off

How to pick the best propeller for water take-off

The controllable pitch propeller simplifies the problem, but is seldom installed on smaller ships and it is primarily for the operators of such craft that these experiences are recorded.

THERE WAS A TIME when few pilots would cruise their engines at more than about 85 per cent of the rated r.p.m. This was before the days of manifold pressure gages, and many other gadgets. The consensus of opinion now seems to be that as long as the manifold pressure is kept down, the r.p.m., within reasonable limits, are not so important. It is thus possibility of using relatively high r.p.m. but sufficiently low manifold pressure which has enabled us to "do things" with fixed pitch propellers.

Before going further, it may not be amiss to mention a few of the essential differences between the takeoff characteristics of the landplane and of the seaplane. In the landplane, there is, in the first place, much less drag from what may be called external sources, (that is, the friction from the wheels) at the beginning of the takeoff. In the second place, this external or secondary drag decreases rapidly as the speed increases, since the wings take the load off the wheels. In the case of the seaplane, the reverse is true. The initial drag of the floats, when the throttle is opened and the bow comes up is fairly high and *increases* in proportion to the square of the speed reaching a maximum just before the ship rocks forward onto the step and begins to plane. There is a sharp drop in the water drag at this point, but again the resistance begins to increase as the square of the speed, through this increase, is offset to some extent by the decrease in wetted surface as the plane begins to lift. About half the total time required for takeoff is used in getting on the step.

The point at which the maximum power is required is just before the ship goes on the step. The speed at this time is 20 to 25 m.p.h. Hence, it is obvious that the maximum thrust is needed at an extremely low ground speed.

Since the pitch of a propeller is the distance it will move forward in one revolution, assuming no slip, it is obvious that the seaplane propeller should have an extremely low pitch to be efficient at the "hump", where the throttle is open but the speed is only 25 m.p.h. or thereabouts. On the other hand, too low a pitch will mean that the r.p.m. in the air will be excessive. This trouble however, may be lessened to some extent by using a propeller with a relatively large diameter. The large diameter also has the effect of working on a much larger volume of air. It is of course well known that the area of the propeller disc increases as the square of the diameter, so that by using a propeller of 10 per cent larger diameter, the disc area, and hence the approximate volume of air acted upon, is increased 21 per cent.

Accordingly, the first conclusion is that when a ship is put on floats the propeller pitch should be decreased and the diameter increased.

But this is by no means the whole story. The average pilot or owner is interested in only three items of performance: takeoff, climb, and cruising speed. By following the new practice on engines, we have been able to improve the takeoff to a startling degree, help the climb, and maintain, or slightly better, the cruising speed. The maximum speed cannot be used except in emergency, as the r.p.m. is much too high for safe operation, but who cares about maximum speed anyway.

For satisfactory seaplane service the diameter of the propeller for engines from 100 hp. to 350 hp. should be increased at least 6 in., if possible, over that used on the landplane, and the pitch decreased so that the engine will *cruise* at the rated r.p.m. for full throttle. A red line should be marked on the tachometer face at the point of rated r.p.m. To determine the proper pitch the manifold pressure gage should be consulted. The pitch should be such that the manifold pressure at the rated full throttle r.p.m. does not exceed that specified for cruising. For example, the 285 Jacobs is normally cruised at 1,900 r.p.m. manifold pressure 23 in. Hg. Its rated r.p.m. is 2,000. The seaplane propeller then should be designed to pull 23 in. Hg at 2,000 r.p.m.

If the ship is not equipped with a manifold pressure gage, the proper r.p.m. for cruising with the new propeller may be obtained from the manufacturer's horsepower charts. Suppose, for example, that as a landplane, the ship is equipped with a motor rated at 2,000 r.p.m. and cruised at 1,850 r.p.m. By consulting the charts it may be determined what percentage of the maximum power is recommended for cruising. Assume that it is learned from the chart that 1,850 r.p.m. produces 70 per cent of maximum power when the engine is equipped with a prop which allows it to turn 2,000 r.p.m. wide open. Then the seaplane prop should be designed for a maximum r.p.m. which is such that at 2,000 the engine is also developing 70 per cent of maximum power.

For example, the Warner 145 is rated at 2,050 r.p.m. and cruised around 1,900. The horsepower chart indicates that under this condition, the power output at 1,900 is 66 per cent of maximum. The seaplane propeller was designed so that the engine turned 2,350 at full throttle but used 67 per cent of maximum power at 2,000.

With the co-operation of Mr. W. E. Pester, of Pester's Propeller Service, comparative tests between propellers were run on two ships, a Waco ZQC (Custom Cabin with 285 Jacobs), and a Fairchild 24 C8E, with 145 Warner. The form of the test reports differs slightly because they were run independently, Mr. A. M. Brown testing the Fairchild and the writer the Waco, and also because the Fairchild was not equipped with a manifold pressure gage. As a matter of fact, there was no need to make the tests at all except to get accurate figures, for the difference in the ships when the proper propeller was used was so pronounced as to be immediately noticeable.

Test on Waco ZQC

Load: Standard Edo float equipment, five passengers including pilot with total passenger wt. of 795 lb., approx. 30 gallons of gasoline, 5 gal. oil.
Weather: Broken clouds, Wind S.E., velocity 6 to 8 m.p.h.
Propeller No. 1 (original equipment) Curtiss-Reed, one piece forged dural; No. M 5319. Dwg. 55501-78. Dia. 8 ft. 3 in. Pitch 6 ft. 6 in.
Average of three take offs: 37 seconds
Cruising speed at 1920 r.p.m., 23 in. Hg: 130½ m.p.h.
R.p.m. before going on step: 1,750
R.p.m. on step: 1,800
R.p.m. maximum at full throttle: 2,100
Propeller No. 2: Curtiss-Reed, No. M-6119, Dwg. 55501-70½, Dia. 8 ft. 6 in., Pitch 5 ft. 10½ in.
Average of three take-offs: 24 sec.
Cruising speed at 2,000 r.p.m. 23 in. Hg: 131½ m.p.h.
R.p.m. before going on step: 1,800
R.p.m. on step: 1,860
R.p.m. maximum at full throttle: 2,180

It will be noted that the first propeller requires *50 per cent longer* for take off than the second. Weight was added between the runs, of course, to make up for the gas used. It will further be noted that the cruising speed with Prop. No. 1 was slightly lower than with No. 2. There was no appreciable difference in the weather conditions between the two tests as they were made within fifteen minutes of each other. However if there was any slight change it was in favor of the old propeller, as the wind seemed slightly fresher while it was being run and was also in a slightly better direction for the speed trials which were made over a course of 4.26 miles.

The next report, on the Fairchild gives the results of a test run on a different day. Unfortunately exact figures on the pitch of the wooden propeller are not available. They were requested from the manufacturer but were never supplied. Hence the pitch dimension is omitted on both. The difference in the form of the report has already been explained.

Test on Fairchild 24

Gross weight of ship (full authorized load): 2,250 lb.
Weather: Calm.

	Prop No. 1	Prop No. 2
	Wood	Curtiss-Reed
	Dia. 7 ft. 6 in.	Dia. 7 ft. 9 in.
	Turns 2,165 max.	Turns 2,350 max.
Average take-off	37 sec.	27.1 sec.
Take off r.p.m.	1,800	1,840
Climb in one minute	420 ft.	530 ft.
R.p.m. during climb (68 m.p.h. ind.)	1,900	2,025
Cruising speed at 1,900 r.p.m.	102.1 m.p.h.	
Cruising speed at 2,000 r.p.m.	103.8 m.p.h.	
Est. power output at cruising (1,900 r.p.m.)	66 per cent	
(2,000 r.p.m.)	67 per cent	
Fuel consumption (from chart)	9.7 gal./hr.	9.2 gal./hr.

Take-offs were made in alternate directions and averaged.
Take-offs were all normal, setting flaps in half-down position and letting ship fly off unaided, rather than attempting optimum take-off. This was done to reduce possible variable of piloting technique.

The objection may be raised that running at the higher r.p.m. will overheat the engine in warm weather. The reverse is apparently true, as observations on both ships indicate that the cylinder head temperature as shown by the thermocouple, is about 50 deg. *less* with the faster propeller. This is not submitted as being anything conclusive, but merely as an interesting sidelight. Whether this temperature drop is due to the difference in the blade section of the propeller, its faster r.p.m., less side thrust on the cylinder walls or something else entirely, the deponent sayeth not. The general conclusion is, after all is said and done, that when it comes to seaplanes within reasonable limits the bigger the propeller and the flatter the pitch the better things will be all around.

Photographs Courtesy Edo Aircraft Corporation

What Plane Shall We Buy?

Airline executives facing the question of equipment evaluation will find an answer in this study of operating costs.

By Herbert V. Thaden

FOR ANY GIVEN AIR TRANSPORT OPERATION, the evaluation of a type of equipment for use thereon should normally be analyzed from at least the following standpoints

1. Air worthiness
2. The sales and market requirements
3. The economic profit possibilities

Included in Item 1 are such factors as the ability of the equipment to take off, to adequately clear surrounding obstructions and to land at the prescribed terminals, compliance with all air worthiness requirements in the air and on the ground, and meeting minimum operating speed requirements from a sales standpoint. For the purposes of this paper, none of these airworthiness factors will be further discussed. It will be assumed that all types of equipment considered meet at least the minimum requirements

Under Item 2, sales and market requirements, are such factors as comfort considerations for the passengers, cargo handling requirements, single vs multi-engine operation, etc In addition, the actual magnitude and habit and time distribution of the potential passengers or cargo (daily as well as seasonal) must be seriously considered. This factor has a very direct bearing on Item 3, as it very largely influences the minimum permissible capacity of the equipment as well as the number of schedules that may be required for a given tonnage movement.

Included in Item 3 are all of the detailed cost factors normally involved in the ownership of flying equipment which may logically be divided into two basic categories the direct flight costs and the indirect flight costs In the latter are such items as housing, traffic promotion and handling, passenger and cargo liability and property damage insurance, communications, terminal and airway costs and administrative costs

Included in the direct flight costs are equipment depreciation charges, insurance reserves (or premiums), fuel, oil and crew costs, and maintenance and overhaul costs (shop overhead costs should be included as a part of the cost of the last two items).

Considering these cost items individually, one finds among the operators a considerable divergence of opinion as to accounting practice. The unfortunate influence of inappropriate railroad accounting and untrained transport accounting is evident Fortunately this situation is correcting itself

In the matter of depreciation in airline operation, engines depreciate, or wear themselves out, while the aircraft obsolete themselves or become unfashionable. Thus it is not uncommon for one aircraft to outlive two or three engines

Modern all-metal or metal structured fabric-covered aircraft have led

useful lives up to six and eight years. Conservative practice would probably dictate an accounting write-off of three to four years, with a salvage value at the end of this term giving an equivalent life of, for instance, five years.

In this paper, all the aircraft are assumed depreciated on an annual rate of one-fifth of the initial cost This would seem justified except in those cases where the equipment was used very intensively throughout its entire life in which case an hourly depreciation rate based on, say, 8,000 to 12,000 hours, could be used In most cases, however, it will be found that the annual obsolescence rate will exceed the hourly depreciation rate The average life of an engine is on the increase

Three thousand hours would appear to be conservative for modern engines used in the current manner of 60 to 70 per cent power at cruising with full power output restricted to take off The probabilities are that lives of four to five thousand hours will soon become possible and probable. For the purposes of this paper, a three thousand hour replacement life has been assumed.

The next cost item considered concerns equipment lost due to attrition This cost appears in the form of an insurance premium or an equivalent cash reserve. Accounting practice varies to a considerable degree on this item

Insurance companies will share this risk with operators at an annual premium cost of anywhere from eight to twenty per cent of the equipment's value, with generally a 10 per cent deductible for minor accidents depending on the specific risk involved, the magnitude of the operation, and the experience factor of the operator. The general practice is to put such insurance on a flat or fixed-rate basis per year rather than an hourly or mileage basis Whatever basis is used, it ultimately must insure a profit to the insurance company if they are to continue in business An economic loss is inherent in the hazards of the operating business and hence this loss must be paid for by the operation. For purposes of the example given later, it is assumed that all of the equipment evaluated will have an annual insurance reserve cost of 10 per cent of the initial value of the equipment to care for major losses and an annual variable cost reserve of 0.00002 of the initial cost of the equipment

(Turn to page 76)

TABLE I

Operating Characteristics Various Type Airplanes

		Type A	Type B	Type C	Type D
Power, total twin engine	H P	570	800	1,420	1,800
Gross weight	#	6,600	10,100	18,560	24,000
Cruising air speed (65% Power-5000 ft Alt.)	m/h	195	181	175	180
Station to Station Speed (85% C.A.S. average)	m/h	165	154	149	153
Fuel consumption	#/H	210	260	462	585
Empty weight (incl. radio)	#	4,220	6,325	12,200	15,300
Pyrotechnics	#	67	67	67	67
Crew	#	340	340	340	340
Oil	#	97	105	285	495
Fuel and Cargo	#	1,876	3,263	5,668	7,800
Fuel for 1,000 miles	#	1,340	1,690	3,100	2,830
Net Cargo for 1,000 mi	#	536	1,573	2,568	4,970
Nat Cargo for 600 mi	#	1,070	2,250	3,820	6,100
Net Cargo for 200 mi.	#	1,600	2,930	5,060	7,220
Initial Cost to operator	$	37,750	52,000	80,000	105,000
Power plant cost	$	7,750	12,000	20,000	23,000
Airplane less power plant.	$	28,000	40,000	60,000	82,000

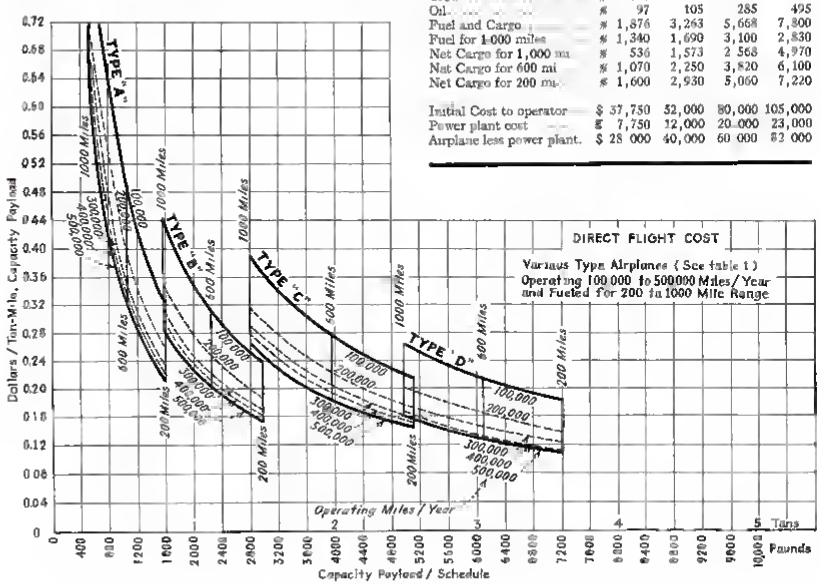


Figure 1

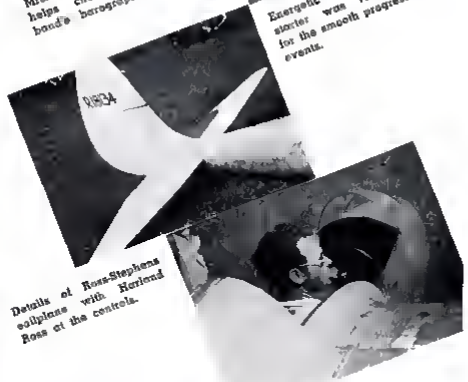
ELMIRA Glimpses

Photographs by AVIATION

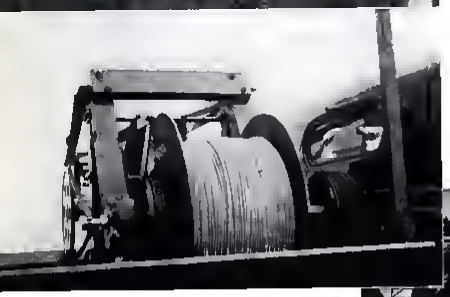
All events on Harris Hill were controlled from the tower in front of the new administration building

Mrs. Lewis Barringer helps check her husband's barograph.

Energetic Earl Southee as starter was responsible for the smooth progress of events.



Details of Ross-Stephens sailplane with Harland Ross at the controls.



Above: Dick du Pont gives the signal for a tow-off by his new winch.

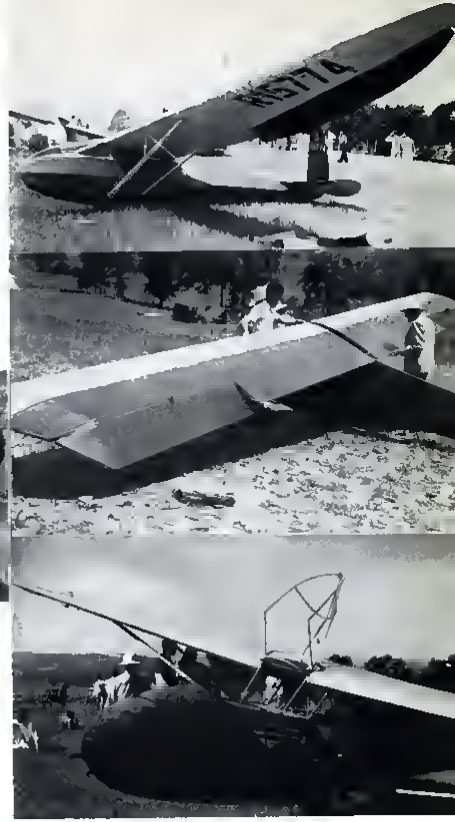
Below: Close-up of the du Pont winch showing the drum with its 4000 feet of rope, and the vee-belt drive

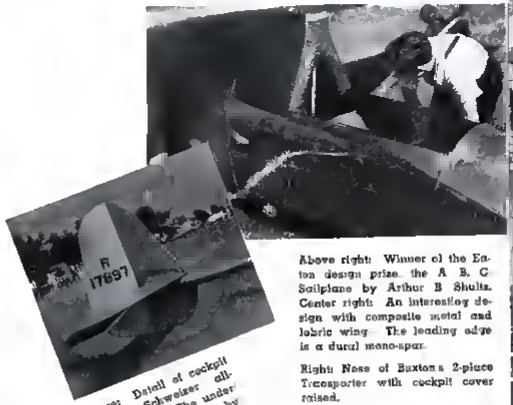
Details of the power winch developed under Kurt Lange's direction. Note friction drive

Whee the Eighth Aenual Soaring Contest ended on July 11th, the registration list disclosed that 54 machines of all classes and 157 pilots had participated, an all time high. Richard duPont was judged American Champion for 1937, although Germany's Peter Riedel collected 156 points to duPont's 182. Other outstanding point winners Chester Decker, 178; Emil Lehecka, 178; Harland Ross, 172; and Lewis Barringer 171. Design prizes went $1000 to the A.B.C. Glider Club $500 to Ross-Stephens Aircraft Corporation for the beautiful RS 11; and $300 to the Schweizer Brothers for their allmetal design.

Longest flight was Riedel's trip to Tidioute Pa., on July 8, 133 miles, which earned him the Vincent Bendix Trophy and $500. Riedel also took the duration record of the meet by staying aloft for 8 hr 32 min. First altitude honors (and the Felix duPont Trophy) went to Dick duPont with 5 850 feet recorded on July 2

Charles Tubbs took the Henry Harris Memorial Trophy for New England pilots with 101 points. Fred Burns took the American LaFrance trophy. The Sherman Fairchild Group Trophy went to the Southern California Soaring Association.



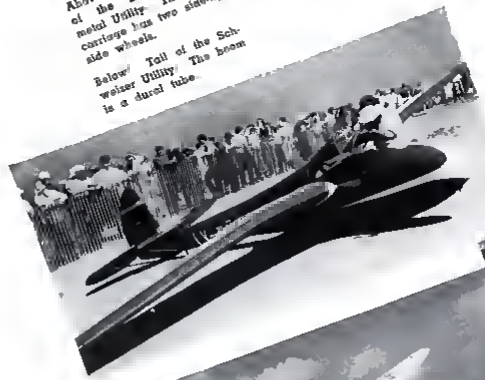


Above: Detail of cockpit of the Schweizer all-metal Utility. The undercarriage has two side-by side wheels.

Above right: Winner of the Eaton design prize, the A. B. C. Sailplane by Arthur B. Shultz. Center right: An interesting design with composite metal and fabric wing. The leading edge is a dural mono-spar.

Right: Nose of Buxton's 2-place Trecsporter with cockpit cover raised.

Below: Tail of the Schweizer Utility. The boom is a dural tube.



In the foreign built group.—Above left: A visitor from Lithuania.

Bronius Oaklais acrobatic machine. Right. Dick du Pont's Minimoa GR circucls on admiring group.

Lower left. Law Barringer secures his Minimoa III Note "spoilers" in wing center sections.

Clipper Wings GROW LARGER

A Roundup of Big Aircraft Present and Future

By C. F. McReynolds, Jr.

Aviation West Coast Editor

CONTINUING their well established leadership in the manufacture of large, long range aircraft, five different American manufacturers are building new and larger transport planes of land or sea type. Of equal significance are the studies being conducted by these and other plane builders into the problems of building equipment several times larger than any now in service. We have assurances by our best technicians that construction of such "visionary" planes of perhaps 200 000 to 300,000 lb. gross awaits only an order from the operator who requires such equipment.

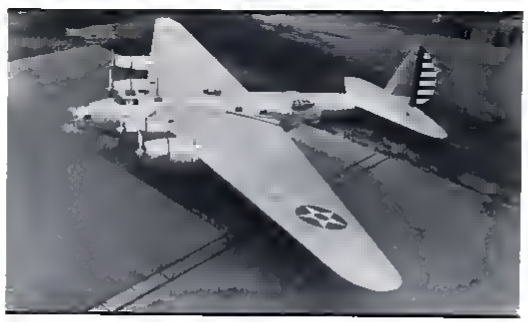
Also significant is the longer range, higher speed, and increased operating altitude for which the new planes are designed. Engineers now speak quite casually of supercharged transports operating at 30,000 ft. altitude at cruising speeds of 250 m.p.h. Maximum range is being pushed beyond the five thousand mile mark.

Most ambitious program is under way in Seattle, where the Boeing Aircraft Co. is building four different categories of four-engined planes of both land and sea, military and civil type. Starting with the Model 299 bomber the Boeing company has concentrated on the perfection of the four-engined plane of 30,000 to 80,000 lb. gross weight.

The able performance of the 299 was first revealed by a 2,100 mi. non-stop hop from Seattle to Dayton at 232 m.p.h. average. The army has since re-designated the plane as the YB-17 and has purchased thirteen, of which ten are already in service. On one routine flight from March Field, Calif., to Barksdale Field, Louisiana, one of the YB-17s averaged 235 m.p.h. for the 1,500 miles. Most interesting Boeing military plane is the new XB-15, also a four engine bomber type. No official information has been released on this plane, but it is believed to have a much greater load carrying capacity than the YB-17, which has a gross weight of 17 tons. Powered with four Pratt & Whitney Twin-Wasp Sr. 1,000 hp. engines the XB-15 appears to be capable of a top speed of greater than 200 m.p.h. The first plane of this type is awaiting flight tests at the time of writing and production of the plane in moderate quantities may reasonably be expected pending outcome of such tests.

Whatever may be the military value of the Boeing YB-17 and XB-15, their contribution to construction and operation of large commercial planes cannot be exaggerated. Many allied problems of design, and of manufacture, more or less peculiar to large equipment, have been carried further toward solution in these planes than ever before. Problems of pilot technique, balancing and operating of controls, arrangement and application of instruments and auxiliary devices, installation and operation of auxiliary power plants for generating electric current supply, wiring, lighting, radio and many other detailed developments have been greatly advanced through construction of the big bombers.

On the civil side Boeing is now building eight four-engined landplanes for Pan American Airways and TWA, and six four engined flying boats for PAA. The Boeing Model 307 landplane is roughly of the same general size as the YB-17 bomber, and the Model 314 flying boat is of about the same dimensions as the XB-15, so both ships will tread well explored paths of design and construction. Most interesting feature of the Model 307 landplane is provision for sub-stratosphere operation to an altitude of 30,000 ft. The 307 will have a span of 107 ft. 3 in., a gross weight of 42 000 lb. and a cruising speed estimated at 200 m.p.h. at sea level, 250-266 m.p.h. at 20-30,000 ft. The ship is powered with four G-100 Wright Cyclones giving a total of 4,400 hp. and provides daytime accommodation for 32 passengers. By night 18 passengers will be accommodated in berths and eight more in sleeper chairs.



The Boeing Bomber XB-15 for the Army

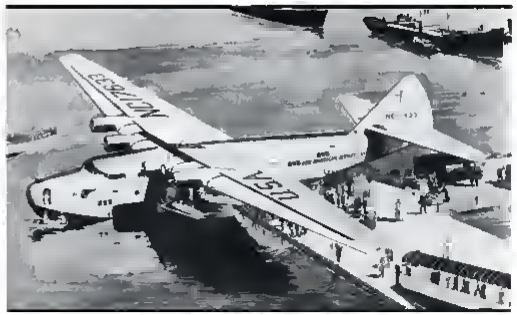
The 307s for TWA are to be placed in service, probably early in 1938, without provision of cabin supercharging for altitude flying although construction is such that this equipment may be installed later. The PAA 307s are to be built as stratosphere planes from the start and though no official confirmation is available it is understood that they are to be placed in the New York-London service where it is believed maximum advantage can be gained through flying at heights up to 30,000 ft. on the Eastbound trip. Numerous studies have been made of cabin supercharging by most major American plane builders and this feature has been found simpler than might have been supposed. Structural problems are minimized by using a fuselage of circular cross-section throughout. Cabin air is circulated in a closed system, with about 10 per cent being exhausted on each round, which minimizes power required. Centrifugal superchargers rotating at 40,000 r.p.m. compress and heat the air. Deodorizers are incorporated in the system. It has been found that sudden puncture of the closed cabin while at high altitude would be neither dangerous nor inconvenient for passengers or crew.

Following conventional American transport plane practice, the 307 is a low wing cantilever monoplane. A single rudder is employed, and landing gear is conventional. Construction is of aluminum alloy throughout the structure, with monocoque fuselage and internally braced wings with stressed skin alloy cover.

The 314 flying boat is also of aluminum alloy structure but the cantilever monoplane wing is mounted at the top of the fuselage, conventional hydro stabilizer floats being incorporated in the hull. With a span of 152 ft. the Boeing boat will weigh 82,000 lb. gross and have a top speed of 200 m.p.h. or better. Provision for a maximum load of 72 passengers is being made, with a crew of eight. Maximum range will be in the neighborhood of 5,000 miles. The plane is powered with four of the new 1,500 hp. twin-row Wright Cyclones.

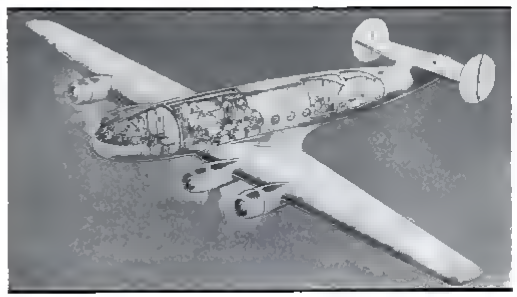
Production on both the 307 and the 314 is now well advanced in the Boeing factory, although the flying boat will be in the air several months in advance of the 307, probably before the end of 1937. Final assembly of the 314 is under way as this is written, the assembly jig taxing the facilities of Boeing's huge plant. Throughout the factory new processes and methods have been developed to speed production and cut costs on the erection of such giant craft. In the machine shop men who once worked on steel fittings of "thumb and finger" size now find it necessary to devise set-ups for blocks of steel as large as a fat man's leg. Among other machine shop aids is the fascinating new contour cutting torch.

(Turn to page 42)



What the Boeing Clippers for P. A. A. will look like

Artist's conception of the Boeing Model 307 Transport



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Trained aviation engineers are available for consultation on the use of the New Texaco Airplane Oil, now on sale at principal airports.

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by which a roller following an intricate pattern may guide the torch which slices through steel eight inches thick. In the metal shop we note a spot-welder with jaws six feet deep for handling huge sheets of metal. In the drop hammer building dies to a length of more than six feet are handled as a matter of routine, an overhead crane being employed for handling from storage floor to hammer.

At the Consolidated Aircraft Corporation plant in San Diego work has been proceeding for months in a screened experimental department which is in itself as large as many complete airplane factories. Yet it is rumored that the plane under construction there will have to be moved out into the open before final assembly. Unfortunately this is a military development for the U. S. Navy and no official information is available from any source. However, it may be surmised that the general features of the ship under construction are those of a four engine flying boat on which Consolidated was recently granted a design patent. Such a boat would closely follow conventional design except to incorporate the retractable wing tip floats such as are on the PBY-1 flying boats. Powered with four engines, probably of the new 1,500 hp class, the Consolidated military boat will perhaps approximate the size, weight, and range of the Boeing 314.

Although Consolidated has not built any equipment for commercial operators recently it is easy to appreciate that, with such a military background, they are prepared to do so. Further evidence of Consolidated interest in the commercial field is given by a study recently made by I. M. Laddon, Consolidated Chief Engineer, as to the optimum size of such a flying boat as could be built at the present stage of the industry. The study showed it feasible to produce a twin-hull flying boat monoplane with a gross weight of 300,000 lb to carry 150 passengers cruise at 230 m.p.h., with a range of 4,000 miles. Twelve engines in the wing with a total of 18 000 hp would drive six tractor propellers. Such a plane would provide individual staterooms for first class passengers, recreational facilities, and the utmost luxury throughout. A wing loading of 46 lb per sq.ft. would promote passenger comfort in rough air. In connection with the trend toward higher wind loadings Consolidated engineers have made studies of auxiliary launching devices. Tests have shown it entirely feasible to launch such a large plane from a special rail car-locomotive unit which would serve as a booster catapult. Diminution of fuel supply before reaching the destination would provide for landing with a wing loading of about 30 lb. per sq.ft., which is entirely practicable.

Although Curtiss-Wright has built many large aircraft in the past, including the Condor bombers and sleepers, present development of super planes by this firm is believed confined to engineering studies. These have been most extensive and have investigated all phases of engine arrangement, altitude problems with supercharged cabin, and other features peculiar to planes in a class with the Boeing 314 and the Douglas DC-4. Technically, Curtiss-Wright is prepared to construct such commercial clippers on order.

At the Douglas factory in Santa Monica, Cal., we find one of the most interesting of all the large planes. The new DC-4, now in the assembly stage, is the product of the most intensive engineering concentration ever brought to bear on a single aviation problem. Specifications were drawn up jointly by engineers of American Airlines, Eastern Airlines, Pan American Airways, TWA and United Airlines on the basis of years of airline operations under all conditions. An effort has been made to anticipate airline equipment needs of the next several years. On completion, the first DC-4 is to be placed in test operation by each of the airlines which have joined to purchase the new Douglas type, and production orders will be placed only after service tests have proved every feature of the plane. Of low wing cantilever design the Douglas resembles previous models from this plant. Chief difference is the tricycle landing gear, being here incorporated in a large plane for the first time. A triple rudder is used, partially to offset the increased height caused by the normally level position of the plane when at rest. Use of the tricycle gear is believed to provide an additional safety factor for high speed landings, and will also be more comfortable for passengers.

The DC-4 will use four Wright Cyclones, giving a total of 5,000 hp. Gross weight is 60 000 lb., wing span 138 ft. 3 in., cruising speed 200 m.p.h. and range with a full load of 40 passengers over 700 miles. As in the case of the two new Boeings, the new Douglas will be built for sleeper service, with berths for 30 people. Specifications of the DC-4 may be said to be "cruel" and as a result the most intense application to problems of heating, lighting, ventilation, radio communication, etc., has been required. As in the case of the Boeing 307, the DC-4 will be an "all electric" plane, current source being two gasoline engine electric generator units. This development alone is of major importance. Although still a secret project due to military application, the auxiliary gasoline generator units are receiving hours of flight testing in their introduction in the new Boeing XB-15 bomber, and will doubtless have been brought to a stage of commercial perfection by the time the DC-4 is ready for test flights late this year.

An amazing flying boat, about which little has been heard, is the Douglas DF (See AVIATION, January, 1937). This ship, powered with two Wright Cyclones, looks much like the Empire flying boats except for number of engines and the fact that the DF is equipped with floats which retract inward into the wing. With luxurious accommodations for 36 people this craft has a range of almost 1,000 miles; a maximum range with reduced payload of more than 3,000 miles. Span of the wing is 95 ft. and gross weight 28 500 lb. The DF may be considered a "trial house" for future Douglas flying boats of which no information is now available. Several of these boats have been built and sold to Japan and Russia.

General features of the Martin Clippers are too well known to require comment. Newest Martin is the 156 which has a gross weight of 62,000 lb and a wing span of 157 ft. Powered with four Wright Cyclones the 156 has a total of 3,400 hp, a cruising speed of 156 m.p.h. and a top speed of 190 m.p.h. For the future we have the results of several Martin engineering studies.

It is significant to keep in mind that in the landplane field Martin has devoted a great deal of attention to the problem of stratosphere operation and every phase of this matter has been investigated by actual test, including physical reactions of human beings to pressure changes, effect of pressure changes on aircraft structures, etc. In the development of flying boats beyond present practice Glenn Martin has indicated that the 150 passenger flying boat of 300 ft. span and 250,000 lb. gross weight is the next logical step. He anticipates that such a ship would cruise at not much over 150 m.p.h. although top speed might be 230 m.p.h. Eight engines with a total of 16000 hp would

(Turn to page 45)

Ordered for **ARMY DOUGLAS BOMBERS**

The United States Army Air Corps recently ordered 531 Wright Cyclone engines for 177 new Douglas Army Bombers—representing the largest order placed in this country for heavy bombardment aircraft since the World War.

Wright Cyclone engines also power all of the 133 Douglas B-18 Army Bombers that were ordered last year—making a total of 310 twin-engined Douglas Army Bombers now under construction, or to be built, for the United States Army Air Corps.

Over 2000 modern Wright Cyclone engines are now in use in Army aircraft, or on order for the United States Army Air Corps.

In addition to the Douglas Army Bombers, Wright Cyclones power all of the huge four-engined Boeing Army Bombers, the swift twin-engined Curtiss A-18 Army Attack Planes, the North American O-47 Army Observation Planes, the Curtiss A-12 Army Attack Planes, the Martin B-10 Army Bombers, and the majority of the Army Cargo and Transport Planes.

"Fly With Wright the World Over"

WRIGHT
AERONAUTICAL CORPORATION
PATERSON NEW JERSEY

Bring on your big planes—

Our Runways are CONCRETE→

says Minneapolis

Runways at World Chamberlain Airport, Minneapolis are 150 ft. wide and 3,000, 3,800 and 3,500 ft. long, with 6 in. slab cut to 20-ft. strips thickened to 9 in. at edges. WPA project under sponsorship and direction of Board of Park Commissioners, Minneapolis. C. A. Bossen Supt. A. E. Berthe, Park Engineer

MODERN planes are heavy—still heavier planes are being built. No runway will *stay smooth-riding and safe* under them without adequate beam strength or ability to spread the heavy wheel loads over the subgrade. Concrete spreads loads over large areas. Even when the ground beneath is softened by heavy rains and thaws, concrete runways keep the true, even surface so welcome to the boys in the cockpit.

Concrete offers many other advantages. A non-skid surface without a roughness damaging to tires . . . good drainage without excessive crown . . . a light-colored surface highly visible day or night . . cleanliness, no dust or danger from flying particles.

The first cost of concrete is surprisingly moderate, and the actual cost is lower than for other types of runway over a period of years. For concrete can be accurately designed for given wheel loads and landing impacts. Its high safety factor and great durability insure long service life with the absolute minimum of maintenance.

Before you plan your airport, write for Information Sheets and the booklet, *"Concrete Makes a Modern Airport."*

PORTLAND CEMENT ASSOCIATION

Dept. 8-41, 33 W. Grand Ave., Chicago, Ill.

(*Continued from page 42*)

be required. In considering this power requirement, calling for engines of 2,000 hp., it is interesting to note that engine men now intimate that the 1,800 hp. radial engine will soon be available.

Pioneer builder of American four engined transports, Sikorsky recently built the S-42-B, a larger and faster version of the original S-42. This plane is in regular service on Pan American routes, carrying a payload of 25 passengers over a range of 1,000 miles, or a reduced payload of 1,000 lb. over a distance of 3,460 miles. Dimensions almost duplicate the earlier S-42, span being 118 ft. 2 in., but gross weight has been upped to 42,000 lb. and cruising speed to 163 m.p.h. A total of 3,000 horsepower is provided by four Pratt & Whitney Hornet engines.

Sikorsky, in common with other American builders, has made intensive engineering strides looking to larger planes. Detailed engineering is understood to be under way on the next Sikorsky Clipper, a plane similar in design to the S-42-B, but with a gross weight of 100,000 lb. The new Sikorsky will accommodate 40 passengers and have a range of 4,500 miles. Wing loadings will approach 40 lb. per sq. ft. It is this plane which has been publicized as incorporating a promenade deck and dance floor.

Although space does not permit detailed mention, it should be stated that a really great number of designers and builders of many types of equipment have worked as intensively as the manufacturers named above in bringing about the development of the new equipment which is destined to soon extend American supremacy even farther along the world's commercial airways. Many problems of developing new materials, new manufacturing processes, wire, paint, rubber, glass, special alloys, etc., have been solved. Builders of engines, propellers, radio equipment, instruments and auxiliary devices of many sorts have all contributed generously of their experience and ingenuity to meet new problems. Ventilating engineers, soundproofing experts, upholsterers, interior decorators, tire manufacturers, brake builders and a host of other allied people have all joined forces to push American aviation achievements to new heights. And in the final analysis it is this ability of American engineers to bring all the resources of American industrial experience to bear on the problems of developing one particular type of aircraft that has made our new Super-Clippers possible.

Comparative Listing of Representative Landplanes

Make and Model	Engine	Total Power	Wing Span	Weight Empty	Gross Weight	Cruising Speed	Top Speed
Douglas — DC	4 — Wright Cyclones	5,000	138' 3"	40,000	60,000	200 m.p.h.	237 m.p.h.
Armstrong-Whitworth Ensign	4 — Armstrong-Siddeley	3,200	123'	.....	45,000	160 m.p.h.	200 m.p.h.
Boeing — 307	4 — Wright Cyclones	4,400	107' 3"	.....	42,000	200 m.p.h.	250-266 m.p.h.
Douglas—DST	2 — Wright Cyclones	1,800	95'	16,000	24,000	190 m.p.h.	216 m.p.h.
DeHavland — Albatross	4 — Gipsy Twelves	2,000	.....	.....	.....	200 m.p.h.	.....

Comparative Listing of Representative Flying Boats

Make and Model	Engine	Total Power	Wing Span	Weight Empty	Weight Loaded	Cruising Speed	Top Speed
Boeing — 314	4 — Twin row Wright Cyclones	6,000	152	.....	82,000 lbs	.....	200 m.p.h.
Martin — 156	4 — Wright Cyclones	3,400 h.p.	157'	29,357 lbs	52,000 lbs	156 m.p.h.	190 m.p.h.
Martin — 130	4 — P. & W. Twin Wasps	3,320	130'	24,611 lbs	52,000 lbs	130 m.p.h.	180 m.p.h.
Sikorsky — S-42-B	4 — P. & W. Hornets	3,000	118' 2"	24,000 lbs.	42,000 lbs.	163 m.p.h.	190 m.p.h.
Short "Empire"	4 — Bristol Pegasus	3,260	114	23,500 lbs.	40,000 lbs.	160 m.p.h.	200 m.p.h.
Douglas — DF	2 — Wright Cyclones	1,700	95'	17,315 lbs.	28,500 lbs.	160 m.p.h.	185 m.p.h.

Midget Racer—

Built by employees of Consolidated factory

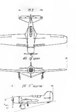
EXTRA OF A MAJOR AIRCRAFT MANUFACTURER into the field of American closed course racing—at least by proxy—was signalized recently when employees of the Consolidated Aircraft Corporation, San Diego, Calif., completed and test flew a promising new midget racer. With a total wing area of only 35 sq. ft. and powered with an English Pobjoy "Niagara" engine, the little plane showed an indicated top speed of 200 m.p.h. The plane has a wood wing of cantilever type and steel tube fuselage with spruce fairing strips and cloth and screen wire covering. Control surfaces are also of steel tube construction with cloth cover. The plane was designed and constructed under the direction of C. C. Flagg, of the Consolidated Final Assembly Inspection Department with the help of Young McClure, Lionel Machado, Sheet Metal Department; Herbert Hewell, Joe McCannon, Final Assembly and Joe Sturgess, Hull Department. Hugh Nicholson, Jr., Final Assembly Department, made the initial flight tests. Specifications are as follows:

Wing span	14 ft. 6 in.
Length	12 ft. 6 in.
Height	3 ft. 10 in.
Wing area	35 sq. ft.
Weight (empty)	408 lb.
Wing loading	19 lb./sq. ft.
Power loading	7.77 lb./hp.
Fuel capacity	12 gal.
Oil Capacity	2 gal.
Engine	English Pobjoy "Niagara" —90 hp.
Propeller	Wood—62 in. diameter, 42 deg. pitch at 2/3 station
Max. speed (designed)	200 m.p.h.
Landing speed (with flaps)	58 m.p.h.
Landing speed (without flaps)	70 m.p.h.

Constructors of the plane expressed particular appreciation for help given by I. M. Laddon, Consolidated chief engineer, and numerous other officials of the company.

Bellanca Mailplane

28-90 is Commercial Version of Mollison Ship

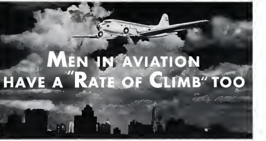


If beauty is as beauty does then the new Bellanca Model 28-90 is one of the most beautiful airplanes ever built. This is the commercial version of the Model 28-70 Bellanca in which James Mollison set a new speed record for a trans-Atlantic crossing in October 1936 a type originally developed for the late MacRobertson Race. At that time our noted contemporary C. G. Grey took delight in christening the plane the Irish "Shamrocket" and generally ridiculing this unusual Bellanca, so he must now view with mixed feelings the purchase of twenty such planes by Air France for high speed mail service. And the French mail is really "going places" when put aboard the Bellanca, for the cruising speed of this plane is 250 m.p.h.

A two place low-wing wire-braced monoplane, the Bellanca 28-90 is equipped with retractable landing gear, a combination rarely found. The Pratt & Whitney Twin-Wasp engine is mounted, providing 900 hp. at 6200 ft. altitude. The square tipped wings, with Bellanca "B" airfoil section, are tapered in plan form, and in thickness near the tip. Ribs are closely spaced along the two spars and the entire wing is fabric covered. Fuselage structure is welded steel tubing with wood fairing and cloth covering. The retractable landing gear is of wide tread construction which, together with fixed tailwheel, provides unusual stability in taxying. Tail surfaces are wire braced and cloth covered. All controls operate on ball bearings.

Specifications and performances of the Bellanca 28-90 are:

Wing span	46 ft. 14 in.—14.06 meters
Length	25 ft. 11 in.—7.9 meters
Height	8 ft. 8 in.—2.64 meters
Wing area	279 sq. ft.—25.92 sq. meters
Weight empty	4330 lb.—1965.8 Kg.
Payload	1060 lb.—481.24 Kg.
Total useful load	2425 lb.—1100.95 Kg.
Gross weight	6755 lb.—3066.77 Kg.
Max. speed (Full load at 6200 ft.—1889.76 M.)	280 m.p.h.—450 Km/Hr.
Cruising speed at 75 per cent power	250 m.p.h.—402 Km/Hr.
Service ceiling	30,500 ft.—9296.4 M.
Climb to 15,000 ft. (4572 M.) from sea level (Full load)	6 min. 54 sec.
Rate of climb at sea level (5455 lb. gross weight)	3760 ft. per min.
Range with 150 gal. gasoline	800 miles—1288 Km.



Four times a year BOEING SCHOOL graduates about 50 young men, who have a definite advantage in the climb to success

The acid proof of any school is the success of its graduates.

So it is important to you to know this: although Boeing School has never promised to place graduates 85% of the total number graduated during the last three years are on the way up in aviation!

These recent Boeing School graduates are forging ahead in every field—from scheduled transport pilots to radio and instrument technicians, from metals experts and aeronautical engineers to field managers and operations officials. With 28 major airline, aircraft and engine companies—from China to England!

There are solid reasons why Boeing School training gives you an "edge" in the fight for success. As a division of United Air Lines, this school has the benefit of more than 100 million miles of air transport experience. It benefits also by close contact with major builders of engines and aircraft.

Location, too, is important. At United's Pacific Coast terminus you are surrounded by actual air transport operations.

The school equipment includes 10 training planes, 15 factory-type shops and laboratories. Teaching staff numbers 30 experts in transport flight, manufacturing and commercial problems. (An average of one instructor to every seven students! You get *more hours* of individual training.)

Next regular enrollment September 27

HOW MUCH EDUCATION TO ENTER?

Eight courses require only high school education. The other seven require some college, or special training.

1937 BOEING SCHOOL BULLETIN fully describes school and courses, tuition costs and convenient payment plans. Contains valuable guide to opportunities, qualifications, duties, lines of promotion. Bulletin sent free on request to prospective students and vocational counselors. Mail coupon today!

"AIRLINE PILOT and OPERATIONS" ...most famed of BOEING SCHOOL'S 15 "career" courses

The course for young men who wish to qualify as airline pilots—and rise to executive positions where flying ability and comprehensive technical training in all phases of aeronautics are primary requirements. Studies include 48 technical subjects, 260 hours dual and solo flying, advanced instrument and beam piloting, cross-country flight in 1350 h.p. transport. Most complete training available. Duration 18 months. ONE OF SEVEN BOEING SCHOOL PILOT COURSES.

SEVEN GROUND COURSES from 12-week "Aircraft Sheet Metal" and various radio and mechanics courses to 24-month "Air Transport" and "Practical Aeronautical" engineering courses. You benefit by *more hours of individual instruction*—Boeing School's staff includes 1/6 of all the licensed ground instructors in U. S. air schools!

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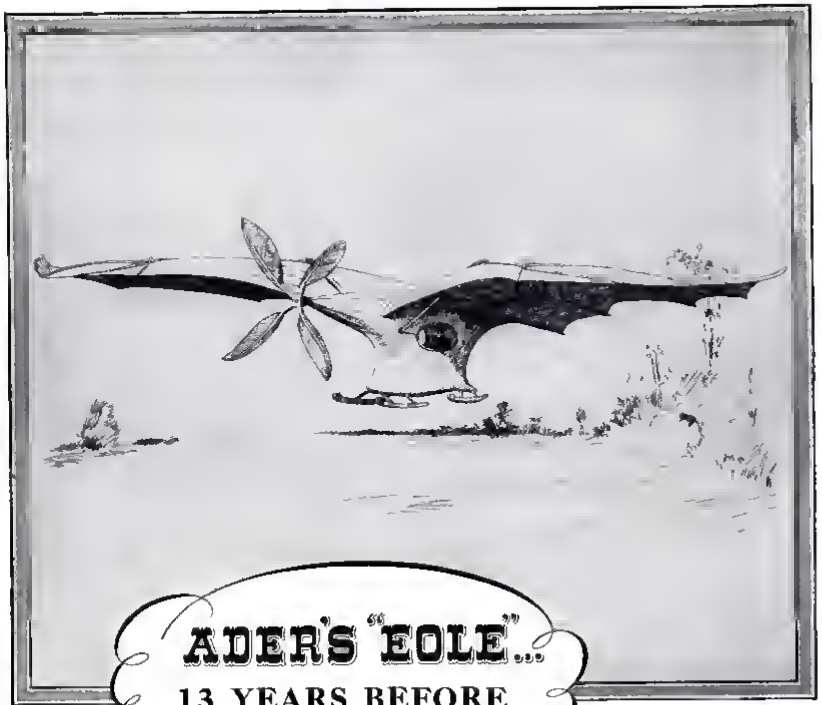
Department T-29 Airport, Oakland, California
Please send BOEING SCHOOL BULLETIN without obligation to me. (I'm interested in courses checked)

☐ Airline Pilot and Operations ☐ Airline Operations ☐ Air Transport Engineering (2 years pre-engineering required)
☐ Transport (or) L. C. Pilot ☐ Airline Mechanic ☐ Practical Aeronautical Engineering (2 years pre-engineering required)
☐ Private (or) Amateur Pilot ☐ Aircraft Sheet Metal
☐ Non-scheduled Inst. Rating ☐ Airline Technician (for engineering graduates only)
☐ Airline Dispatching & Meteorology (for engineering graduates only) ☐ Special Airline Pilot (for Transport Pilots with 400 hrs.) ☐ Home Study Courses (for those in the industry)

Name ______ *Age* ______
Years in High School ______ *Years in College* ______ *Phone* ______
P. O. Address ______ *City* ______ *State* ______



ADER'S "EOLE"... 13 YEARS BEFORE KITTY HAWK

CLEMENT F. ADER, French electrical engineer and inventor of a telephone, succeeded in attaining a short, uncontrolled flight with this birdlike monoplane in 1891, near the Chateau d'Armainvilliers, Gretz, France. Designed with a screw propeller forward, it was driven by a 40 horsepower steam engine. It flew 150 feet—then smashed—a victim of deficient equilibrium.

It took thirteen more years of development and a change to a gasoline motor with a better weight-power ratio, before the Wright brothers gave the world its first successful powered flight.

After the first success of gasoline-powered motors, constant search for better power-weight ratios called for improvements in both fuels and engines. Ethyl engineers have contributed materially in this development and today are cooperating in research aimed at still further improvements. Ethyl Gasoline Corporation, Chrysler Building, New York, N. Y.

Ryan Cabin

Is companion to familiar ST series.

COMPANION to the familiar ST series of open monoplanes is a new closed ship now undergoing tests after two years of engineering development. Announcement of the new model has just been made by T. Claude Ryan, president of the company.

The Ryan Cabin is a three place full cantilever, low wing type of metal construction and powered with either the 150 hp. Menasco or the 145 hp. Warner engine. The tapered wing structure is of metal with metal skin carrying part of the stresses in the forward section and fabric covering in the rear.

Production version of the Stearman-Hammond Model Y

Production Model "Y"—

by Stearman-Hammond has many detailed refinements.

NOW IN PRODUCTION at the South San Francisco factory of Stearman-Hammond Aircraft Corporation, the 1937 version of the Stearman-Hammond Model "Y" incorporates a number of changes and refinements from previous models. Chief of these is that rudders are fixed, serving only as fin area, all control being accomplished by ailerons and elevator. Also the shape of the air scoop bonnet over the cabin has been substantially altered, improving the appearance. Now available with the supercharged Menasco C4S engine of 150 hp., as well as the standard 125 hp. Menasco the Stearman-Hammond "Y" shows a top speed with the larger engine of 130 m.p.h. Construction is of metal throughout (24S-T alloy) with cloth covered wing.

Fuselage construction is semi monocoque and wing is full cantilever with single box spar. Flaps are of split trailing edge type, tail group is full cantilever, landing gear is of three wheel tricycle type, and fuselage incorporates engine in the rear with pusher propeller. Generous luggage space is provided in rear of the two place cabin, which is equipped with large doors on each side.

Standard equipment includes General tires, Hayes wheels and hydraulic brakes, Warner oil and spring shock absorbers, Exide battery, Fafnir and Torrington bearings for engine and plane controls, Grimes navigation lights, electric starter and generator.

Specifications:

	Model Y-1 English	Model Y-1S English
Engine	Menasco C-4	Menasco C4S
Span	40 ft	40 ft
Length	26' 10.75"	26' 10.75"
Height	7' 10.81"	7' 10.81"
Wing area	210 sq. ft.	210 sq. ft
Power load'g	17.1 lb/hp	14.5 lb/hp
Wing loading	10.2 lb/sq ft	10.35 lb/sq ft.
Weight empty	1400 lb	1425 lb
Useful load	750 lb	750 lb
Payload	310 lb	310 lb
Gross weight	2150 lb	2175 lb
Baggage	100 lb	100 lb
Fuel	40 gal	40 gal.
Oil	4 gal	4 gal

Performance:

	Model Y-1 English	Model Y-1S English
Max. speed	120 m.p.h.	130 m.p.h.
Cruising speed	110 m.p.h.	120 m.p.h.
Landing speed:		
With flaps	40 m.p.h.	40 m.p.h.
Without flaps	50 m.p.h.	50 m.p.h.
Service ceiling	15,000 ft.	18,500 ft.
Climb per min.	600 ft.	725 ft.
Cruising range	540 mi.	500 mi.

Student working on Boeing T-5

Boeing T-5

All-metal monoplane designed and built by Boeing students.

DESIGNED PARTICULARLY to meet the specialized requirements of a flying school, and designed and built by the students as a training project, the new Boeing T-5 all-metal low wing monoplane trainer is nearing completion in the Boeing School shops at Oakland, California, the T-5 is a side by side cabin plane of the most modern type, with cantilever wing and tail surfaces

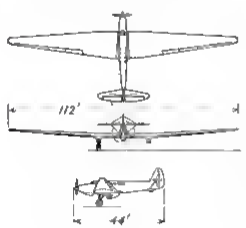
With Foreign Builders

New flying equipment from overseas reviewed by Lucien Zacharoff

On the premise that the shortest routes between Moscow and San Francisco, Moscow and Chicago, London and Tokyo etc, lie across or in the vicinity of the North Pole, the transpolar non stop dash from the USSR to USA has been acclaimed as opening a new epoch in air transport. If a fraction of enthusiastic appraisals of the feat by international experts is accurate, the ANT-25, twice chosen by the three Russian airmen for Far North distance flights, is of particular interest to this department, and is not merely the airplane of the month but rather of the year. In any event, no other type of aircraft has to date demonstrated as admirably the feasibility of systematically faultless flying in the Arctic parts.

A number of unusual features endow this low-wing cantilever monoplane with its record-breaking qualities. An outstanding characteristic is the wing which is almost 30 per cent longer than the wing of any other plane of analogous construction. It is noteworthy that despite its 112-ft. span with about a 10-ft. chord, the wing is virtually free of vibration. The technical problem of creating a large but light wing and, at the same time, eliminating the vibration hazard, was solved by Professor V. Yetchinkin and Engineer V. Beliayeff, after testing numerous models in the wind tunnel. Molybdenum and koltchug aluminum tubing went into the wing which is trimmed with corrugated koltchug-aluminum and streamlined with fabric.

Needed rigidity is enhanced by gi-



ANT-25 powered by a 850 hp. AM-34-P engine

gantic fuel tanks, each 21 ft. long, integral with the wing and carrying part of the load. Professor A. N. Tupoleff's comment is: "The location of the fuel tanks in the wings is of great assistance in making the plane sturdy. Here is why. The wings of a heavily loaded machine undergo great stress in flight under the action of aerodynamic forces directed upward. The force of the fuel's weight is directed downward and thus lessens this stress."

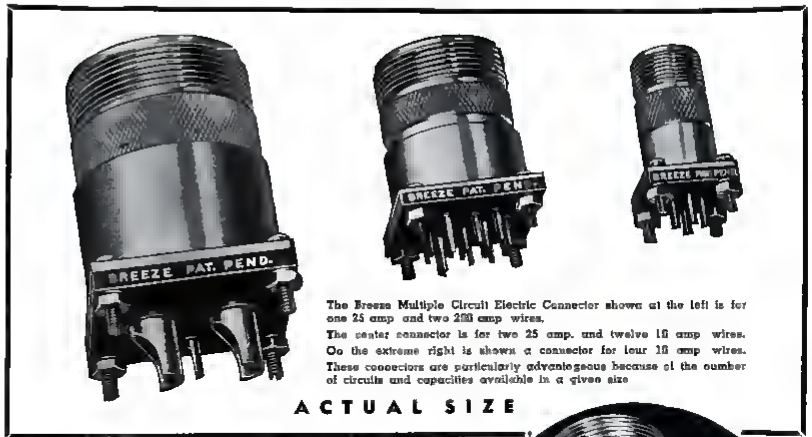
The two main spars form a girder of chro-molybdenum and koltchug-aluminum tubing, and are joined by the upper surfaces of the fuel tanks. Upper wing surfaces are painstakingly laquered and polished off for minimum resistance in flight. Aerodynamic efficiency is also served by the retractable undercarriage, the first of its kind in the USSR, in flight the wheels are withdrawn directly into the wings. In the interests of a firm takeoff and preservation of the direction taken on the runway the low-pressure tire wheel in the rear is attached rigidly instead of the conventional swiveling arrangement.

The monocoque fuselage is of oval cross-section, its framework trimmed with thin koltchug-aluminum sheet. In front is the pilot's compartment with all the necessary apparatus. In the middle is the navigator's section and aft of that is the co-pilot's cabin. Thanks to dual controls, the navigator is enabled to handle the plane from the co-pilot's cabin, while the pilots change seats. Because of the necessity of flying at high altitudes and in bitter cold, the interior is heated by exhaust gases from the engine. These pass through tubes mounted along the walls of the fuselage. Any desired temperature is available to the crew. Additional oxygen is fed from special tanks aboard when passing through rarified atmosphere.

When the ANT-25 was originally designed for normal flying as a land plane its designers were not worried about the possibility of a forced landing on the sea or amid ice floes. But when the plane went in for non stop flights over unexplored regions the problem of landing on water was studied with models. As a result of the experiments rubberized fabric ballons were placed in the spacious wings to be rapidly filled with air, increasing the ship's buoyancy and enabling it to remain on the surface for several days, according to N. Lebedeff of the Central Aero-Hydrodynamic Institute.

That a single-engine plane was chosen for the trip so beset with surprises and difficulties is a tribute to the AM-34-P engine and its originator A. A. Mikulin. It is the power plant which has been figuring prominently in a variety of aircraft on

(*Turn to page 53*)



The Breeze Multiple Circuit Electric Connector shown at the left is for one 25 amp and two 250 amp wires.
The center connector is for two 25 amp. and twelve 10 amp wires.
On the extreme right is shown a connector for four 10 amp wires.
These connectors are particularly advantageous because of the number of circuits and capacities available in a given size

ACTUAL SIZE

BREEZE MULTIPLE CIRCUIT ELECTRIC CONNECTORS

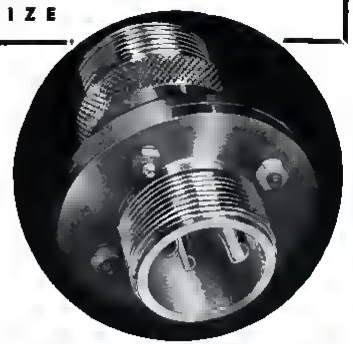
provide quick, positive contacts

These connectors, specially designed for aircraft and aircraft instrument service are compact and light in weight. They provide a quick and positive method for simultaneously connecting or breaking a multiplicity of electric circuits.

Special design of contact pins assures quick and easy attachment of wires as well as high efficiency of electrical contact.

All Breeze Connectors are shielded for use in conjunction with radio apparatus. They are designed for use with Breeze standard shielding conduit and fittings.

Full details of sizes and assembly combinations available on request.



SPECIAL MULTIPLE CIRCUIT CONNECTORS

The connector shown is actual size (photographed at about a 45° angle)

These special Breeze connectors with the addition of socket shielding as shown provide a 100% shielded connection for use in conduit lines to break connections at fire walls, bulk heads, wing roots etc. without the necessity of using junction boxes.

Available in a complete range from 1 to 40 contacts with contact capacities ranging from 10 to 200 amperes.

Detailed specifications on request

BREEZE AIRCRAFT PRODUCTS—Radio Ignition Shielding Assemblies including Spark Plug Shielding . . . Flexible Conduit and Fittings . . . Junction Boxes . . . Flexible Shaft and Cone Assemblies for Remote Control Tachometer Drives, Fuel Pump Drives, etc. . . . Flexible Gas and Oil Lines . . . Internal Tie Rods . . . Ammunition Rounds Counters . . . Radio Tuning Units . . . Propeller Pitch Controls . . . Generator and Ignition Filters . . . Elevator and Rudder Tab Controls . . . Airplane Cable Heaters . . . Flexible Tubing of Stainless Steel, Aluminum, etc. . . . Exhaust Gas Analyzers . . . Stainless Aluminum Gasoline and Oil Tanks. STAINLESS STEEL DIVISION—Pioneers in the design and development of Stainless Steel Structures and Stainless Steel Fabricated Products.

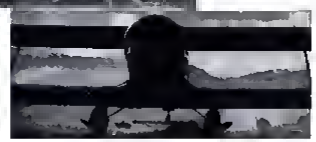
BREEZE CORPORATIONS, INC.

Newark BREEZE MARK New Jersey

Beechcraft
Brings the
Open Spaces
Nearer

FLEET prong horns (60 m.p.h.) are slow for Beechcraft and camera

The combination of super-airline cruising speeds (177 to 235 m.p.h.) and the ability to land slowly and safely under difficult conditions, makes the *Beechcraft* the outstanding value in aircraft-utility. *Beechcrafts* go wherever an airplane can operate and bring the interesting remote areas within a few hours of the great metropolitan centers. We offer these photographs and this letter as an example of how one owner obtains pleasure from his *Beechcraft*

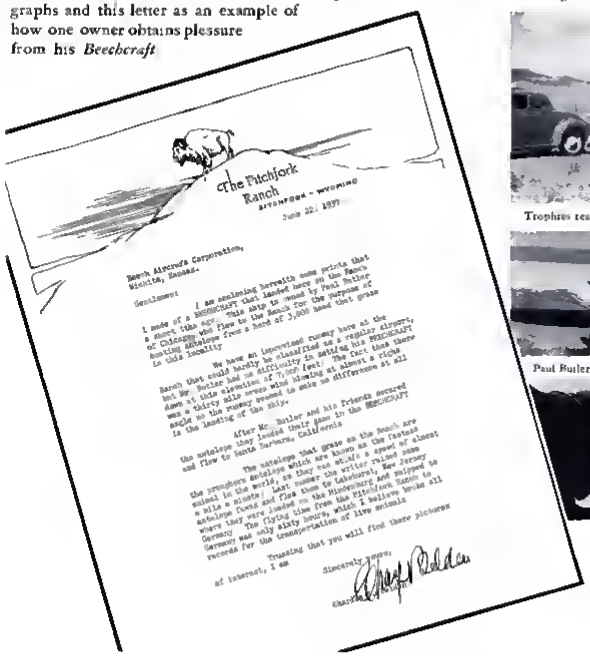


Taxiing in after a cross-wind landing at 7000 feet

Trophies ready for a trip four times faster than in life

Paul Butler's BEECHCRAFT at PITCHFORK Ranch

Beechcraft master of mountain flying



BEECH AIRCRAFT COOP.
6411 E. CENTRAL
WICHITA - KANSAS
U. S. A.

(*Continued from page 50*)

record flights and in routine performances. Originally developed at the Central Institute for Aviation Motor-Building, it was perfected at the Frunze Factory.

About twelve years ago Mr. Mikulin conceived the idea of a high-power engine, and AM-13, from which AM-34 was later evolved, was born. It developed 800 hp., and was the most powerful of the period but it disclosed several shortcomings. Because of an incorrect distribution of gas some cylinders received a leaner mixture than others and in these cylinders the temperature used to rise abnormally, overheating the valves and leading to a variety of mishaps in the initial tests. Only when new high-grade heat-resisting steel was developed did AM-13 become acceptable.

In 1929 Mr. Mikulin designed a 1 000 hp. engine, the immediate precursor of AM-34. The originality of design and the amount of power called for brought some skepticism from engineers and airmen. Only the aid of Engineer P. I. Baranoff, who perished in the crash of the huge *Maxim Gorky* a few years ago, made possible the realization of this engine.

The stock model, now coming off the line at the Frunze plant in a steady stream, is a two-row V-type weighing 1,420 lb. It has 950 hp. at 1,950 revolutions. The crankshaft of chrome-nickel steel, has six elbows, with an angle of 120 deg. between them. Due to special conditions under which it has to work on the ANT-25 the engine was designed to operate on a very lean mixture. Special treatment of the valves as well as the installation of steel saddles obviated the danger of burned out valves.

A characteristic of the engine is its longitudinal rigidity which makes for sturdiness. This is attained by a solid aluminum head and water-jacket drawn up by long steel pins.

Liquid cooled and twelve-cylinder, the AM-34 as employed in the ANT-25 is somewhat supercharged. The engine received high endorsements at international exhibits in Paris, Milan and Copenhagen. It is safe to assert that for some time to come Soviet altitude and distance records will be set with the AM-34, with possible improvements in the present high-performance plant.

Many chrome-metal two and three-bladed propellers had been designed and tested. The final choice was a three-blade propeller which, in addition to desirable aerodynamic qualities, exhibited a remarkable balance, an important factor in a distance flight in which the slightest vibration in this quarter may injuriously affect the delicate and complex network of pipelines stretching from the engine to the fuel and lubrication tanks.

Experience of the flight showed that the ANT-25 radio equipment had a (3,728 miles). It was of small size reliable range of 6,000 kilometers and weight and easy to operate. The radio apparatus was ordered at the end of May from the Ordjonikidze Plant which had introduced appreciable improvements over the equipment used by the three flyers on their last year's non-stop trip of 5,852 miles. Besides the main receiving set, the plane carried a reserve receiver of improved sensitivity and range. Both sets, mounted in the upper section cover a wide range of long and short waves. Although designed for telegraphic work, the receivers were also able to take radio telephone signals. The transmitters, however, worked only by Morse code.

The radio apparatus was installed on a special leather shock-absorbing cushions, immune from shocks and vibrations inevitable on long flights. The radio lent itself to ready dismantling and reassembling outside the plane, in case of emergency. The crew carried special equipment for radio operation on the ground—a gasoline motor, dynamos, and light jointed aluminum pipes for the masts of the aerial.

In addition to the already-cited wing span, the ANT 25 has the following specifications: Length, 44 ft.; height, 18 ft.; wing area 946 sq.ft.; weight empty, 9,240 lb.; wing loading, 26.24 lb./sq. ft.; power loading, 26.4 lb.-hp.; maximum speed 150 m.p.h.; duration, 100 hours.

Professor Tupoleff admits that, judged by the ultra modern standards the plane may appear obsolete, conceived as it was five years ago. Yet, it remains unsurpassed in its cruising radius and its wing elongation so essential to distance aircraft. The ship still continues to amaze even experienced airplane builders by its completeness. The tremendous role of the ANT-25 in the history of Soviet aviation was brought out by Professor Tupoleff:

"The intrinsic value of the ANT-25 plane lies in the huge part it played in the development of Soviet aviation engineering. Experimental work conducted on the plane at the testing grounds brought both the plane and the engine nearer to perfection. Suffice it to say that during the first tests of the ANT-25 its cruising radius scarcely reached 7,500 km. (4 660 miles). But last year, after making a flight of over 9,000 km. (5,592 miles), Chkaloff, Baidukoff and Beliakoff found another ton of gasoline left in the tanks. Hence it follows that given favorable meteorological conditions, the plane could have flown about 3,000 km. (1,864 miles) more.

"How, then, did the engineers, who were tuning up the ANT-25, manage almost to double its flying range? First the power and efficiency of the engine were increased, while the fuel consumption was brought down to 215 grams (.44 lb.) per hp. hour. Secondly, certain parts of the plane were fully streamlined to lower head resistance; the wings were enclosed in a smooth, bright, polished casing. By the application of certain measures it became possible to step up its flying range by at least 15 per cent. A careful selection of the propeller, based on numerous experiments contributed another 5 per cent. In this way, step by step, the reserve capacity of the plane was brought out."

Another matter with vital bearing on the flying range was commented on by the designer. It is the question of the most favorable flying conditions. During last year's flight the three Heroes of the Soviet Union were provided with a schedule of the best speed and altitude for the various portions of the itinerary.

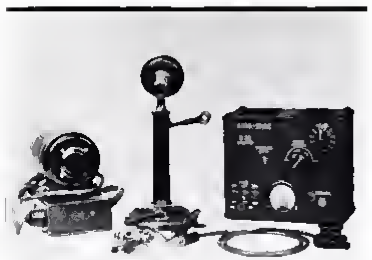
"Without going into details, let us say only that at the beginning of a flight the speed of an airplane is much greater than at its end. There is nothing paradoxical in this. For a heavily loaded plane to stay in the air a higher speed is required than that which is sufficient to keep flying an airplane which has already consumed part of its fuel supply and consequently becomes lighter."

On the subject of potentialities for a near future, Professor Tupoleff declared:

"We consider the building of an airplane capable of flying 20,000 km. (12,427 miles) without either stops or refueling in the air to be quite a feasible proposition. Why do we think it to be a practicable enterprise? Because now we have at our disposal finer, stronger, and constructionally lighter materials, excellent engines, and, lastly, an extensive experience gained in working on the ANT-25. And our future record planes will surpass the ANT-25 not only in flying range but also in speed."

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment



Aerovoice D 30 Transmitter

Radio Transmitter

Of light weight announced by Aerovoice

WHEN THE BEAM POWER TUBE (type 6L6) was first announced its possibilities as a transmitting tube were not emphasized, but radio amateurs and others lost no time in applying it to short-wave transmitters. In so doing they found that it packed plenty of power in a small space, a discovery which led to the use of the tube in medium-power aircraft transmitting equipment. A newly announced aircraft transmitter, the type D-30 manufactured by the Aerovoice Laboratories in Islip, N. Y., illustrates this point; it contains four tubes three of which are 6L6's.

The ratio of performance to weight of the D-30 can be evaluated from the following data: 22 watts output 100 per cent modulated on three crystal-controlled frequencies (3105 kc, 3120 kc. and 6210 kc, harmonic) all from a transmitting unit weighing 6½ pounds and measuring 8½ x 7 x 4¼ inches. The complete installation, with all units including transmitter and power-supply, connecting cables, mounting brackets and accessories, weighs 17¾ pounds. The weightiest part of this assemblage is the dynamotor, 9½ lb.

Two AT-cut, low-temperature-coefficient crystals are used to establish the base frequencies of 3105 and 3120 kc. A tuning knob is available on the panel for doubling the frequency of the final (power-amplifier) stage, thus making available an additional daytime frequency of 6210 kc. An RK 25 (a 24 watt pentode) is used as the power amplifier. On the harmonic frequency, modulation up to 80 per cent is available on phone. Modulated r-w is also available on all frequencies.

Power for the dynamotor is obtained from the usual 12-volt plane supply, the drain being 2 amperes in the standby position and 12 amperes when operating. The transmitter is equipped with an antenna change-over relay, operated by push-button control from the microphone which permits using the same antenna for transmitting and receiving. Either a fixed or a trailing wire antenna of any length may be used.

The transmitter complete with all equipment (transmitter unit, anti-noise microphone, telegraph key and cable, dynamotor, connecting cables, two quartz crystals, mounting bracket and shock absorbers, antenna kit, and four tubes 3-6L6's and 1-RK 24) lists for $299.50.—AVIATION *August, 1937.*

Completed heater nose and Contact Assembly for electrically heated Pitot Static Tube

Pitot Overcoats

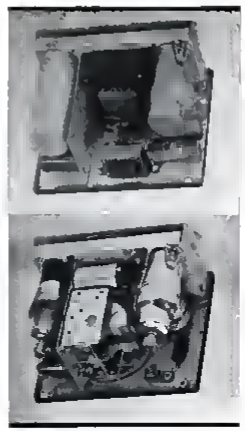
Pioneer offers streamlined heating unit

OVERCOATS FOR PITOT TUBES are offered by the Pioneer Instrument Company, Inc., Brooklyn, N. Y., in the form of an electric heating unit. The heated pitot tube is streamlined with the heating element inserted into the nose piece. This element, of 50 watt capacity and operated on 12 volt current, consists of wire wound on a porcelain insulator and then baked with a vitreous enamel for insulation.—AVIATION, *August, 1937.*

Light from Water—

Sea water used to generate electric light

A NEW MARINE LIGHT of novel type may find wide application among airlines operating overwater services. The light is particularly useful as an emergency device, for use on life preserver jackets, etc., and operates with no fuel other than sea water, which serves, with two dissimilar metals, to produce an electric light. Known as the "Sea-Lite" this unusual device is manufactured by the Sea-Lite Manufacturing Corp., 791 Tremont Street, Boston, Mass.—AVIATION *August, 1937.*



The Receiver Unit (upper) and the power supply (lower)

Lightplane Radio

Small enough for ship's glove compartment

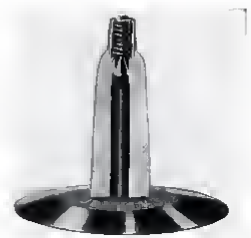
DESIGNED PRIMARILY FOR THE SMALL PLANE, the new RCA AVR-10 and AVR-10-A aircraft radio receivers should help to broaden the use of radio among lightplane operators. The sets may also be used as an auxiliary receiver for other types of aircraft, and by using two sets the operator may simultaneously receive radio beam signals as well as airport traffic control or weather report messages. Such an arrangement is particularly advantageous when approaching a major airport.

With a gross weight of only 8.5 lb. installed the set is divided into two units, the receiver and the power supply units, each measuring 6½x5½x3½ in. overall. The small dimensions and light weight make it possible to install the receiver unit directly on the instrument board or in the glove compartment. Power drain is so low that dry cell operation may be used instead of storage battery if the latter is not part of the plane's standard equipment. Model AVR-10 employs 12-volt current and AVR-10-A uses 6-volt current. The set features ruggedness, simplicity, and long life, as well as ease of installation. Two tubes of standard RCA type are used and control has been reduced to two dials, the frequency selector and volume control, the master switch being an integral part of the volume control. Frequency range is 200-400 kcs.—AVIATION *August 1937.*

Rubber Valve—

For tires saves tube rips after deflation

OF PARTICULAR INTEREST to aircraft operators is the Jenkins rubber capless tire valve manufactured by Jenkins Bros., Ltd., Bridgeport, Conn. With no cap to lose, no replaceable parts and claimed to prohibit entry of dirt or water, the Jenkins valve fits standard chucks and air-hose connections and is enclosed in a tough rubber stem that is claimed to outlast the life of the tube. In the event of puncture and gradual tire deflation the Jenkins flexible rubber valve stem will pull through the rim hole and so avoid the danger of complete blow-out from ripping loose. Makers of the Jenkins rubber capless valve guarantee it to be leakproof for the life of the tube.—AVIATION *August 1937.*



Jenkins capless tire valve

Gear Chamferers—

In three models for air hydraulic or manual operation

THE CINCINNATI GEAR COMPANY, Dayton, Ohio, announces three new models of its high speed gear chamfering machine, all of which will be of particular interest to manufacturers of gears used in the aviation industry as the new machines feature precision production, high speed of operation, and ease of control. Available for either air, hydraulic, or manual operation, the three types are known as 4-A, 4-B, and 4-C. All three models utilize hollow cutters and the cutter heads are provided with rapid traverse to and from cutting position. The work cycle may be completely hand operated or, optional at additional cost, a completely automatic cycle is obtainable. The new machine, in all three models, has already been proven in actual operation in several major plants.—AVIATION, *August 1937.*

Kollsman Manifold Pressure Gage

Manifold Gage

Has mechanism in vacuum sealed chamber

ELIMINATING ANY POSSIBILITY of raw fuel or fumes entering the instrument from the intake manifold, especially injurious in the case of highly supercharged engines using leaded fuels, the latest Kollsman manifold pressure gage, type 296-01, features housing of the mechanism in a vacuum sealed chamber, or cartridge. Jewried bearings and hardened steel pivots are incorporated in an entirely new and rugged mechanism while each instrument dial is individually marked for extreme accuracy. Because of its ruggedness and the vacuum seal feature it is claimed that this instrument may be operated for long periods without servicing. Normal atmospheric pressure is maintained in the instrument case, so that case leaks or broken glass will not affect the reading of the instrument. Since the case is not sealed the glass is held in place by a simple snap ring and may be easily removed to permit adjustment of index arcs conforming to Bureau of Air Commerce regulations for showing the critical pressure of the engine. Enclosed in a bakelite case the instrument conforms to the standard 3¼ in. mounting diameter and has a weight of 14 oz.—AVIATION *August 1937.*

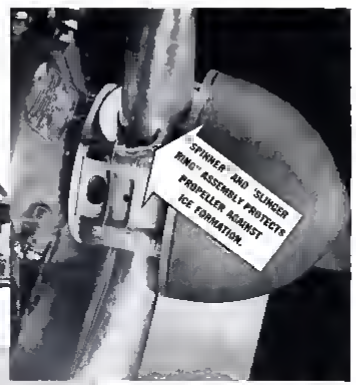
TWA'S NEW SLEEPER SERVICE GOODRICH TIRES, DE-ICERS

TWA Insures *Extra Safety, Extra Comfort* on Giant New *"Skysleepers"* with Goodrich Aviation Equipment

● TWA again steps out with breath-taking new developments in air travel — the luxury of new planes offering separate sleeping compartments and lounges — the roominess of 17 seats in planes licensed for 25 — overnight coast-to-coast schedules that are faster than ever!

And this isn't the first time that TWA and Goodrich have "gone places" together. For years TWA planes have been safety-protected by Goodrich aviation equipment. Like their forerunners, these new luxurious SKYSLEEPERS have the most advanced protection against ice—

AMERICA'S LARGEST LAND TRANSPORT . . . specially built by Douglas for TWA's new overnight SKYSLEEPER service, now operating on schedules that put Broadway only 15 hrs. from Hollywood.



ICE GETS NO FOOTHOLD ON NEW TWA "SKYSLEEPERS." Protecting propellers against accumulations of ice, the spinner and slinger ring assembly shown in close-up above constantly bathes propeller blades with ice-defying solution.

●

AT LEFT: Goodrich De-Icers give *complete* protection. Leading edges, such as the wing section shown, are completely covered by huge rubber "shoes." Continuous inflation and deflation of these shoes automatically cracks ice which blows away as soon as it forms. It is no wonder that aviation today counts Goodrich De-Icers among its leading safety developments.

FLIES WITH AND MANY OTHER GOODRICH PRODUCTS

the Goodrich *De Icer* that makes on time, on schedule flying possible in winter or at high altitudes. And whether going up or coming down there's no disturbing the restful sleep and relaxation of passengers. That's because every new SKYSLEEPER will land and take off on Goodrich Airplane Silvertown Tires.

Goodrich Leads Air Parade

It's a fact that Goodrich is the "first choice" of leading pilots, plane makers and airlines of the world. That's why Goodrich is unusually well equipped to help you—not only with more than 40 aviation products, but with the technical resources and experience that will best adapt these products to your particular planes, regardless of whether they're commercial giants or light sport planes. Write Dept. 639, Aeronautical Division of The B. F. Goodrich Co., Akron, Ohio, for complete information. Ask for a copy of "Goodrich In Aviation."

SHE SLEEPS . . . THROUGH THE "SKY CHIEF'S" ONE LANDING AFTER BEDTIME . . . THANKS TO THE CUSHIONING OF GOODRICH LOW PRESSURE TIRES

Goodrich *Airplane* Silvertowns

THE SAFEST AIRPLANE TIRE EVER BUILT

Over 40 Rubber Products for Airplanes — Including Tires — Tail Wheels — Abrasion Shoes — De-Icers — Matting — Rubber Hose — Grommets — Shock Absorber Cord — A Complete Line of Rubber Aeronautical Accessories.

Operators' Corner

An exchange of ideas on the problems of the commercial aviation industry

QUESTION 25: What solution have you found for smoothing out week-end and holiday peaks in the use of equipment? Do you maintain enough airplanes for slow day requirements and rent equipment from other operators when needed, or do you find it more profitable to have ships idle during the week?

Schedules Planned

WE ARE ABLE TO PLAN QUITE ACCURATELY all of our flight operations because we fly only in giving flight instruction and because we give flight instruction only to regularly enrolled resident students who are living on the airport. Therefore we are able to conduct all of our operations, including flight training, with considerable precision.—FRED C. PARKS, *Director of Sales, Parks Air College, East St. Louis, Ill.*

QUESTION 26: What methods do you use to give your students cross-country flying experience and at the same time make their flying attractive to them? Do you stage air meets, group flights, etc.? If so, how often and how far from the home port do you go? How do you guard against mishaps in these flights and contests? Have you found such activities worth while?

Cross Country Required

CROSS COUNTRY TRAINING is one of the prime essentials of our flying course at Roosevelt and we use smaller ships for the purpose so each student puts in full time at the controls. In the old days we took them out in larger groups in a multi-engined ship but we soon found group instruction undesirable and we switched to smaller equipment such as the Fairchild or Fleet planes.

Navigation problems are worked out in advance by the student and plans for the flight are approved before take-off. The student's first cross country is dual instruction, later he goes solo and reports from his destination. Sometimes students are sent in pairs when one of the two has reached the stage where he can be left in full charge of the ship.

Length of cross country trips depends somewhat on the type of course taken. Each transport pilot graduate is required to have at least one trip to Miami or an equivalent distance of about 2,200 miles. These flights are usually made in groups of 6-10 ships and at least one flight to Miami is made each year. Other long trips are made as the occasion demands. Some of our students always participate in the annual Roosevelt Field—Montreal Good Will Flight.—W. C. ERB, *Registrar, Roosevelt School of Aviation, Roosevelt Field, L. I., N. Y.*

Students Run Airline

WE GIVE CROSS-COUNTRY FLIGHT TRAINING to our Professional Flight students and endeavor to make this training interesting and profitable by having a group of Professional Flight students organize a "dummy" air transport company, set up this air transport company and simulate the operation of a commercial air transport line in the flying of schedules. It is a requirement that each student who flies these schedules must already hold his Transport License. A second student flies with the pilot as navigator; he also holds his Transport License. It is not required that any student fly these schedules; neither is it required that anyone fly with the pilot as navigator, but each student is glad to cooperate in the operation. The schedules are customarily flown between Parks Airport and Indianapolis, the round trip being made usually between the hours of 9:00 A.M. and 4:30 P.M. I should add that the schedules are flown in a Stinson Reliant which is equipped with a full complement of blind flight instruments and also with two way radio. We believe that the operation of this student airline is well worthwhile, not only because of the flight experience it gives the student, but also because of the insight he acquires into the operating problems of scheduled air transport.—FRED C. PARKS, *Director of Sales, Parks Air College, East St. Louis, Ill.*

Plan Morning Flights

WHEN a student has about 20 hours solo we believe it is time for him to get some practical experience in the navigation we teach in winter evening classes. He is taken out for one or more 100-mile trips with an instructor and, when he is ready, we send him out alone to visit the local airports. At the present time we are planning the organization of a "dawn patrol" to give our students early morning cross country flying. Five or six planes will go together with a different leader each morning. At least five or six flights will be necessary to qualify a man for leader.—THOMAS TURMEL, *Operations Manager, The American Escadrille, Floyd Bennett Field, Brooklyn, N. Y.*

QUESTION 27: What methods have you used to develop group flying instruction for your school? Have you offered special rates to clubs, fraternal organizations, educational institutions or similar organizations? Have you found group instruction at reduced rates worth while?

Encourage Clubs

ALTHOUGH practically all of our instruction is on an individual basis, we encourage the formation of clubs on our airport over which we have exclusive rights. These clubs are closed membership organizations formed for the purpose of economical flight instruction for their members. In most cases there is a transport pilot qualified to teach in the group. Where this is not the case we arrange for our instructors to give the necessary training. At present there are four such organizations operating at our Airport.—EDWARD GORSKI, *Manager, Standard Aviation Inc., Bendix Airport Bendix, N. J.*

Next Month's Question

QUESTION 28: The Air Commerce has been considering the possibility of licensing the managers of large airports. What do you think of the idea? To what class of airports should it apply? Is there any standard of qualifications desirable for an airport manager? If so what should the minimum requirement be? Do you think it would be possible to set standards for such a position?

Let's Look at the Record

These marks set by one of America's leading airplane manufacturers only begin to demonstrate the possibilities of 100 Octane Ethyl Aviation Gasoline —first made available commercially by Shell

Major Alexander De Seversky standing next to SEV-3 Amphibian, which holds the following world's speed records:

(Powered with Wright Cyclone 1000-H. P. Motor)

230.4 M.P.H. Record for Amphibians
209. M.P.H. Record for 1000 Kilometers

And the following point-to-point records for both amphibians and land planes:

New York to Miami — New York to New Orleans
New York to Mexico City, D. F. — New Orleans to Mexico City, D. F.
Miami to Havana

Good Night, New York
Good Morning, California

UNITED AIR LINES

5:55 P. M. and it's "good night, New York" as you board United's new DOUGLAS sleeper-type "Mainliner." "Your menu," and a charming stewardess serves a piping hot full course meal as, through your sky window, the sinking sun paints fascinating shadow pictures on the moving terrain below. Then an early evening of lounging, reading, bridge or chatting with fellow passengers. Time to retire and you slip into a berth larger than your twin bed at home. A night of repose on a neat down mattress and you awaken at 10,000 feet feeling the exhilaration of greeting a day in an Alpine lodge! 8:15 A. M. and it's "good morning, California." Like a dream you've spanned the continent over night. Such is the magic of DOUGLAS Sleeper Planes. DOUGLAS AIRCRAFT CO., INC., Santa Monica, California.

DOUGLAS *Sleeper Plane*

GO "DOUGLAS" WHEREVER YOU TRAVEL THROUGHOUT THE WORLD

AMERICA: AMERICAN AIRLINES INC. EASTERN AIR LINES. TWA. UNITED AIR LINES. PAN AMERICAN AIRWAYS. ARANIFF AIRWAYS. WESTERN AIR EXPRESS. WILMINGTON CATALINA AIRLINE.

EUROPE: OELAG, Austria. Deutsche Lufthansa, Germany. K.L.M., Netherlands. L.A.P.E. Spain. Avio Linee Italiane, Italy. LOT Poland. C.L.S. Czechoslovakia. Swissair Switzerland. A.B. Aerotransport, Sweden.

SOUTH AMERICA: Pan American Grace Airways.

AUSTRALIA: Australian National Airways Pty. Ltd.

ORIENT: Japan Air Transport. China National Aviation Corp. K.N.I.L.M. of Netherlands Indies.

News of the Month

Highlighting recent events in the aviation world

Bills, Bills, Bills

A summary of pending legislation affecting air transport

By Blaine Stubblefield
Washington Office

A PAPER STORM of aviation bills fell on the Capitol this session. As air transport outflew the laws that govern it, nosed into new fields of government and business, opened or obstructed opportunity for more men and corporate interests at home and around the world, more people told their congressmen there ought to be a law. So to please the home voters, scores of bills were dropped into the solons' hopper. Many of them were trivial, naive, some perhaps even mercenary. But a half dozen of them are heavy-duty documents written by able congressmen and advisors in an effort to put new legal ribs and spars into fast-moving, fast-growing aviation. Government departments and industry associations are working in Congress toward a legislative framework that will be fair to all and which will stay put, so that long-range planning can have its good effect. Here is a quick look at the major bills which have been presented.

S. 2 (McCarran) H.R. 7273 (Lea)—For regulation of air transport by Interstate Commerce Commission. Both favorably reported by House and Senate interstate commerce committees. McCarran bill is on Senate Calendar. Lea bill is on the House calendar. Possible action in Congress this session.

S. 1760 (McCarran) H.R. 7474 (Crosser)—For safety regulation by Interstate Commerce Commission. McCarran bill favorably reported by Senate interstate commerce committee. Crosser bill not yet out of House committee.

S. 2416 (McKellar) H.R. 7370 (Mead)—For non-contract carriage of overseas and foreign air mail and for extension and regulation of foreign air mail contracts. House Post Office Committee has completed hearings but has not acted on the Mead bill. Senate Post Office Committee has begun, but not completed, hearings on the McKellar bill.

H.R. 4732 (Mead)—For amendment of the domestic air mail act, to set rates during initial contract period. Favorably reported by House Committee on Post Offices and Post Roads, and is on House calendar. No companion bill in Senate.

H.R. 6628 (Mead)—To authorize Post Office to extend air mail route mileage and to fly 52,000,000 flight miles. No companion in Senate. Passed by House. Not yet out of Senate Committee.

First in line is the McCarran-Lea bill. It would amend the Interstate Commerce Act so that, in addition to railroads, motor carriers, pipelines, and railroad-owned shipping lines, ICC would also regulate air transport. All operators, mail and non-mail carriers, domestic, foreign and overseas, would be required to hold, instead of contracts with the Post Office, certificates of convenience and necessity from ICC. And ICC would regulate also the passenger and express rates on the air lines. It already sets the rates on air mail, under the air mail act of 1934. Passage of this bill would take away the Post Office's great power of control over the growth of the air system. This bill has been strenuously opposed by the Post Office through its solicitor Karl A. Crowley. The Bureau of Air Commerce is presumably neutral. The bill is supported by the Air Transport Association, the Air Line Pilots Association, the United States Chamber of Commerce, some substantial newspapers plead for the measure, but many, on the other hand, seem unaware of it.

Second is the Crosser-McCarran air line safety bill, designed to increase safety on scheduled air lines by shifting safety regulation from the Bureau of Air Commerce to the Interstate Commerce Commission. Under this proposed law ICC would regulate the engineering, construction, operation and maintenance of all aircraft used in interstate travel, and would license persons who have to do with construction, operation, and maintenance of such craft. Only difference between the otherwise identical bills: McCarran places *all* interstate and foreign passenger-carrying planes under the proposed law, while Crosser covers only those in scheduled transport. Passage of this bill would leave the Bureau of Air Commerce only the administration of aids to flight, safety of private flyers, and private aviation promotion. Of course the Bureau is opposing it. The measure is supported mainly by the pilots association. The press is comparatively silent in this and the public seems not to know of it.

Third, not necessarily in the order of importance, is the foreign air mail bill. It says that in addition to authorization of foreign air mail by the act of March 1929, the Postmaster General may place overseas and foreign mail on any lighter- or heavier-than-air craft commercially operated between this country and/or its territories and foreign countries, *without formal contract*. The Post Office would simply put the mail aboard and pay the charges, as any other shipper would. Under this proposed law, existing contracts would remain in effect, and could be renewed without advertising for not more than five years each time. But this could be done only with approval by majority vote of a committee of the Secretaries of State and Commerce and the Postmaster and Attorney Generals. In this bill, or some similar measure, the United States will, now or later, indicate whether it is to be represented in foreign air by a single operating company or by a number of competitors. The Post Office is of course supporting this measure, of which it appears to have been the author. The airline operators have confined their testimony on this bill to suggesting means to make the proposed act workable, and to insure that

JOURNEY'S END

The crew of Caledonia, British flying boat, is welcomed at Montreal after flying from England.

it shall not inadvertently apply to domestic as well as to foreign air mail operation. Obviously, however, if the McCarran transport regulation bill is passed, the entire contract system, domestic and foreign will be abolished.

Another Post Office bill our forth item, would amend the Air Mail Act of 1934 to provide that the contract rate of compensation for carrying mail shall remain in effect during the entire initial period of any contract, and would oblige the Interstate Commerce Commission (which fixes mail rates after the contract period) to consider amount of mail, the carrier's facilities, revenues from other than mail sources, and other "material elements"—all to bring air mail transport costs within the limits of postal revenues therefrom beginning July 1, 1940 instead of July 1, 1938, as provided in the present air mail law. The object is to wipe out the Post Office air mail deficit.

Of these last two bills, foreign air mail, and the domestic mail amendments of course neither could pass if the McCarran-Lea bill is enacted.

Two other bills, one by Allen and one by Hames, both Congressmen from Pennsylvania, propose short haul and general experimental flights including substratosphere.

Prophecies as to the ultimate outcome of air transport's proposed laws are not attempted even by Washington's most astute oracles. None of this legislation is on the Administration's "ought" schedule. There is no indication the President is giving the matter his attention. McCarran's and Lea's bill for ICC regulation is called the best bet. But even that, like the others depends, for one thing, on the President's government reorganization plan. That plan, if it became law, might transfer the Insterstate Commerce Commission to the Commerce Department, which would then have much more authority over air transport than it has now. The legislative situation, today, is in a climbing spin.

Revenue Needs Boost—

Analysis of traffic shows need of 15 per cent gain for even break

A DETAILED ANALYSIS of traffic and revenue on the Big Three transcontinentals, American, United and TWA, by R. A. Wright in the *Wall Street Journal*, showed that a 15 to 20 per cent gain in aggregate revenue passenger miles will be required in the last seven months of this year to overcome operating losses sustained in the first five months. Estimates showed an operating expense, at 65 cents a plane-mile, of $26,585,000 and total revenues exclusive of passengers, of $9,675,000, leaving a $16,910,000 gap to be filled from passenger revenues. As the three lines flew 88,670,510 revenue passenger miles in the first five months of 1937, the final seven months of the year would have to show 230,988,490 miles, at the present rate of 8.29 cents a mile, to make up this difference.

P. G. Johnson Named—

To be operations vice-president of Trans-Canada Air Lines

To act in the position of vice president in charge of operations of Canada's new airline system, Trans-Canada Air Lines, president S. J. Hungerford has announced the appointment of Philip G. Johnson. Johnson was president of United Aircraft and Transport Corp., which operated United Air Lines, of which he was also president, at the time of the mail contract cancellations in 1934.

Trans-Canada Air Lines were established by act of the Canadian parliament last April, and the directors appointed were S. J. Hungerford, chairman and president of the Canadian National Railways, who is also president of the new corporation; James Y. Murdock, Honorable Wilfred Gagnon, and H. J. Symington. The line has purchased four American-built Lockheed 14's and three Lockheed Electras for use on this newest of transcontinental airways.

Because radio range flying is unfamiliar to Canadian operations men and pilots, and because for a trans-Canadian air service it is essential, the new line considered it necessary to secure the services of an executive thoroughly familiar with this system of flying and with large-scale transcontinental flying operations."

Atlantic Spanned, East & West—

PAA's Clipper III and Imperial's Caledonia make easy work of an old bugbear

WITH THE CONSUMMATE EASE which showed proper equipment and sound planning, Pan American Airways and Imperial Airways early in July, made their first trans Atlantic survey flights looking to eventual establishment of scheduled Atlantic air service. The Pan American survey plane, the Pan American Clipper III, was a Hornet-powered Sikorsky flying boat (S42-B) of 45,500 gross pounds. The British used one of their Empire flying boats, Caledonia, one of the 28 being constructed for air service to the far corners of England's domain.

Terminal points for the Atlantic survey were Port Washington on Long Island, and Southampton, England. The 1995-mile over ocean link lay between Botwood, Newfoundland and Foynes at the mouth of the River Shannon, Ireland. After easy flights from their home bases to these outposts both planes started out on this hardest stretch the evening of July 5.

Most difficult was the Caledonia's task as she had to fight the North Atlantic's prevailing west winds, at times as high as 35 m.p.h. The Clipper rode on tailwinds for the better part of the journey. But in spite of cold and rain, and a sea obscured by a solid blanket of clouds, neither the Clipper's Captain Harold E. Gray nor the Caledonia's skipper, Arthur Sidney Wilcockson, were able to give any very exciting reports of the passage. Each landed at his destination, respectively Foynes and Botwood, when and how he had expected to.

Noteworthy in the Clipper's crossing was her rigid adherence to the performance predicted for her by Pan American's meteorologist on the first 998 mile leg of the eastward course. A speed of 152 knots and an elapsed time of 6 hr. 36 min. had been predicted from the charts of North Atlantic weather. Actually that leg was covered at 152 knots in 6 hr. 33 min.

The Clipper ended her flight at Southampton on July 8, the Caledonia hers at Port Washington on July 9, having stopped off for a greeting at Montreal. Return flights were made with equal ease, neither ship experiencing any difficulty with the stretch of water fatal to so many.

Airlines Expand —

TWA, NWA, Varney, AA meet rising loads with better equipment

AIRLINE TRAFFIC GAINS continue to impose a heavy load on available flying equipment. To meet the demand, more and more new equipment—bigger, faster, more powerful—is going into service. Below are detailed some of the latest additions to airline fleets.

Up A Million—TWA's President Jack Frye has reported traffic gains for May over April of more than 1,000,000 in seat miles operated. Passengers travelling TWA totaled 7,872 in May, up more than 2,000 over the preceding month. Air express and mail poundage was up proportionately, express increasing 5,000 lb, mail more than 7,000 lb.

Promising further gains was the introduction, June 18, of TWA's new Douglas Skyclub ships on two of the five daily New York-Chicago trips. The ships licensed for 25 will carry seventeen to Chicago in four hours, 45 minutes, to New York in three hours 55 minutes.

Northwest Zephyrs—First of the eight Lockheed 14's ordered by Northwest Airlines for service between Chicago and Seattle was scheduled for delivery July 1. Though designed for fourteen passengers, they will be fitted out for only ten, thereby giving passengers more room, and permitting greater mail and express loads. They will be powered with geared Pratt & Whitney Hornets rated at 850 hp., which will give them a cruising speed of 230 m.p.h.

Lockheeds in Southwest—First of Lockheed's now-famed Model 12 to be ordered for airline use have been delivered to Varney Air Transport, Inc., serving Air Mail Route 29 from Pueblo, Colo., to El Paso, Tex. Delivery of the first of two was taken by Varney President Avery Black, who accompanied Lockheed's assistant test pilot, E. C. McLeod, from Burbank to El Paso.

From G-102 to G-102—Four new DC-3's to be delivered to American Airlines will be powered with Wright Cyclones of the G-102 class, instead of the normal G-100 (a power step-up from 1,000 to 1,100 hp.). This will increase gross weight from 24,000 to 24,800 lb. The new ships will be used between New York and Chicago, where traffic already demands sixteen daily through flights.

SCREWING UP

—not his courage but his suit. Britain's Flight Lieut. M. J. Adams prepares for an ascent which netted a new world mark of 53,937 ft. He flew a Bristol Pegasus-powered Bristol monoplane.

Calendar

July 22-Aug. 1—Fourth International Aviation Meeting Zurich, Switzerland.

Aug. 14-15—First Annual Midwest Aero Club and Sportsmen Pilots Convention, Fort Wayne, Ind.

Sept. 3-6—National Air Races, Cleveland, Ohio.

Oct. 7-9—SAE National Aircraft Production Meeting Los Angeles Cal.

Hanford Night Flights—Permission for night flying over the unlighted airway between Kansas City and Tulsa has been granted Hanford Airlines by the Bureau of Air Commerce. The 214 mile route has three radio range beacons—at Kansas City, Moran, Kans., and Tulsa, and four lighted fields, but no airway beacons. Navigation will depend largely on the recent installation of the Siebanthaler radio compass in Hanford's Electras. The compasses operate in conjunction with a four-band Western Electric receiver.

Racers Prepare —

17th national event promises higher speeds than ever before

BY MID JULY a total of $78,000 had been posted for the National Air Races to be held in Cleveland Sept. 3-6. The outlook seems excellent for a spectacular showing, with the field for the opening gun the Bendix transcontinental race narrowing to a list of super-planes. Scheduled to fly in this are Frank Fuller, in a stripped down Seversky fighter, Roscoe Turner with two ships one the famous "57", and Dick Merrill, who will probably fly his trans-Atlantic Lockheed Electra.

The Thompson Trophy race has been stepped up from 150 miles to 200 miles 20 laps of a 10 mile course with a total purse of $25,000, and as entries are determined by elimination, should prove very fast.

The Cleveland Airport has been greatly enlarged since the last time the races were held there in 1935. The field consists of 1,040 acres, of which 100 acres are hard-surfaced, the remainder being in turf. Ten thousand seats have been added to the grandstands.

NEWEST WEAPON

of the Army Air Corps will be this Consolidated pursuit. Radical in design, it is expected to outstrip anything on military wings when it comes to speed. It is noteworthy in many respects. engines are mounted as pushers, giving the two wing runners unobstructed forward visioo and freedom from the annoyance of propeller blast: it carries a crew of five. armament consists of six machine guns and light bombs: nit fuel load is carried in wing tanks. Engines are the new Allison 12-cylinder liquid-cooled t,000 hp. power plants developed in conjunction with Air Corps eogineers.

Russians Cross Pole—

Three Soviet airmen fly non-stop 5,288 miles from Moscow to U. S.

A LITTLE AFTER ONE in the afternoon of June 17, three men clad in caps and turtle-neck sweaters climbed aboard a wide-spreading monoplane at the military airport at Sholkovo, 20 miles from Moscow. In a few minutes they were heading directly into the North for the North Pole and the other side of the world at Oakland, Cal.

Sixty-three hours and seventeeo minutes later, the great plane eame to earth at the Army Airport at Vancouver, Washington, having flown a non-stop distance of 5,288 miles. Valeri Chkaloff, the pilot, had stayed at the controls the whole 63 grueling hours. The other two members of the crew were Georgi Baidukoff, co-pilot, and Alexander Belsakoff, navigator.

Although their objective was Oakland Airport, fog and bad weather made it impossible to reach San Francisco. After making several attempts to get through they returned north to Vancouver for their landing.

In mid-July a second Soviet expedition not only successfully negotiated the polar wastes, but set a new world's distance record. Three Soviet airmen flew from Moscow to Riverside, Cal., a distance of 6,262 miles, in 62 hours and two minutes. This broke the existing distance record by more than 600 miles. Actually they flew as far as San Diego, but were unable to land there because of fog, and had to turn north again. The three were Mikhail Gromoff, pilot, Andrey Yumasheff, copilot, and Sergei Danilin, navigator.

More Mass Maneuvers—

Consolidateds continue their attacks on distance and time

CONSOLIDATED PBY-1 CLASS PATROL BOATS continued their mass attack on mass flight records during the month of June. On June 21-22 twelve of the PBY-1s comprising VP-3 F squadron under command of Lieut. Robert W. Morse, and carrying eighty four officers and men flew non-stop from San Diego Bay to Coco Solo, Canal Zone, negotiating the 3 085 miles in twenty-seven hours and fifty-eight minutes. On June 20 Richard Archbold had lifted a full load off the surface of Lake Tahoe, 6,224 ft. above sea level, with his Consolidated-American Museum of National History survey plane "Guba", and on June 24-25 he flew the same plane across the continent from San Diego Bay to North Beach, New York in 17 hours and 2 minutes for an average speed of 140 m.p.h.

Then on July 1 twenty-four Consolidated boats of squadrons VP-7, VP-9, and VP-12—eighteen of them the PBY-1 boats and six of the older P2Y3 design—carrying one hundred and forty-four officers and men, flew in formation non-stop from San Diego to Seattle, a distance of 1,200 miles at an average speed of about 115 m.p.h. The flight was under command of Lieut.-Com. Robert Fuller. Continuing to Kodiak, Alaska on July 15th the three squadrons will engage in far-north maneuvers along the Alaskan Coast, returning to California about mid August.

Earhart Lost

Down in Pacific after 20,000 mile world-girdling trip

AFTER successful negotiation of more than 20,000 miles of a projected 27,-500-mile flight around the world, from Oakland, Cal. back to Oakland, Amelia Earhart left Lae, New Guinea, July 2 for the longest and most difficult single jump in the trip, the 2,556-mile stretch of Pacific Ocean to Howland Island. But she never completed that lap.

Somewhere short of her goal she reported desperately by radio that she and her navigator, Fred Noonan, were unable to see the island, and had only 30 minutes of fuel left. That was the last definite and authentic word from her. From then on, for more than a week, the Pacific was scoured for several hundred miles in all directions from Howland, in the hope that she may have landed on some coral atoll or was safely floating on the buoyancy of empty fuel tanks.

But though amateur radio listeners sent in a deluge of reports of having picked up messages from the Earhart plane, none could be trusted as genuine. No decipherable position report had been given, so rescuers were handicapped in not knowing where to concentrate their search. Consensus of opinion was that had the plane landed in water, the flyers would be unable to use their radio. On land, they might have been able to generate radio power with one of the Wasp engines, but lacking fuel would have to depend on the life of their batteries—a few anxious hours at best.

As we go to press, the search continues, but with fading hope.

New Air Mail Low—

PCA asks only $.0000008 a mile between Washington and Buffalo

THE WISH for success at any cost was seen in air mail bids opened in Washington July 12 on invitation of the Post Office Department. Air transport men were astounded at Pennsylvania-Central's record low bid on a new Washington-Buffalo route: $.0000008 (eight one hundred thousandths of a cent) per mile. TWA, obviously anxious to get this route, bid the ridiculous figure of one mill a mile, but PCA's bid makes even this seem exorbitant.

TWA was the only bidder, however, on the long sought Winslow-San Francisco route which the ICC denied them several months ago because it would be "competitive." One mill was the bid on this route also, as it was on a Dayton-Chicago route. Braniff asked 28 cents a mile between Dayton and Chicago, National Airlines System 27 cents.

Three bids were submitted on a Huron, S. D.-Rapid City-Black Hills Cheyenne route: Wyoming Air Service, 19.8 cents, Hanford Airlines, 30 cents, and Cheyenne Flying Service, 33 cents.

Orders to Menasco—

Ryan takes 32 engines, Stearman-Hammond 25, totaling $75,000

MENASCO MANUFACTURING COMPANY recently booked $75 000 worth of new business for its in-line engines, taking an order for 32 "Pirate" engines of 125 and 150 h.p. types from the Ryan Aeronautical Company, San Diego, and an order from Stearman Hammond Aircraft Corp., of San Francisco, for 25 of the supercharged 150 h.p. "Pirate" engines. The Stearman-Hammond order is in addition to 25 Menasco "Pirates" of unsupercharged class ordered recently. Deliveries on both orders are scheduled to start at once and be completed within 90 days. The Menasco company is also rushing work on two Super Buccaneer engines of approximately 300 h.p. each to be instal'ed in the special tri-motored Bellanca now being built for Capt. Alex Papana, Rumanian stunt pilot who plans to fly the Atlantic and then enter his Bellanca in the projected French race around Europe.

Bigger and Better—

New plants going up over the country portend new business

NEW FACTORIES, larger production, higher quality man power, are all reflected in the news of the month from an indus ry that's beginning to assume the status of big business.

Taylor Moves—By late June Taylor Aircraft Co. was substantially moved into its new home at Lock Haven, Pa. Start of production in the new factory was under the supervision of Walter Jamouneau. Taylor's chief engineer. The first plane off the new production line took to the air before the middle of July. Production up to six ships per day is to be expected shortly.

Joint School—To solve the problem of supplying their factories with properly trained men fast enough for their needs, Beech Aircraft, Stearman Aircraft, and Cessna Aircraft, all located in Wichita, are cooperating in a training program in welding, machine shop practice in sheet metal work, functioning under the State Department of Vocational Education. Each company has contributed a part of the practice material in an effort to familiarize the student with the method used in the plant where he will be employed.

Canadian Basing—Marking the company's reentrance into the aircraft manufacturing field after a lapse of five years, the Canadian government has awarded to Boeing Aircraft of Canada, Ltd., Vancouver, B. C., a contract for construction of eleven Blackburn Shark reconnaissance planes. Contract price was not revealed. The planes will be manufactured under license from Blackburn Aircraft Ltd., and will be deliverad to the Royal Canadian Air Force within two years. The Shark is a single-engined, two-place biplane with metal monocoque fuselage and wings of metal structure, fabric covered. The Canadian version will be equipped as twin-float seaplanes.

New Production High

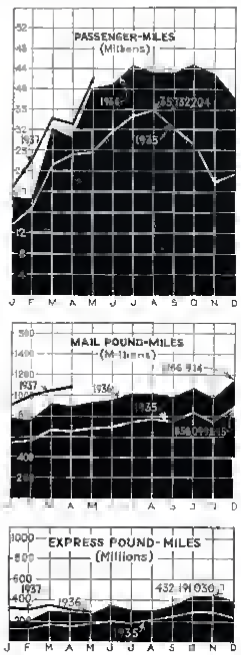
Commerce reports new record for export, too

STARTLING GAINS IN PRODUCTION AND EXPORT of American aeronautical products are revealed by two recent reports by Commerce Department bureaus. A Bureau of Air Commerce report shows production for the first quarter of 1937 as 23 per cent over the same period in 1936. In 1936 the total of all aircraft manufactured in this period stood at 456 planes, while this year the figure was 571. The biggest increase in any one category was in the number of two-place cabin laid monoplanes, a 67 per cent increase having been made. The light plane group accounted for about 57 per cent of the total production for civil use.

A Bureau of Foreign and Domestic Commerce report showed aeronautical exports for the first four months of 1937 with a value of $10,301 924 as

Traffic

Latest available statistics from the Bureau of Air Commerce and the Post Office Department—Domestic airlines only.



AIR TRANSPORT INDICATOR

July 1, 1937

113.2

—which is the ratio of revenue passenger miles for June 1937 as compared with the corresponding figure for June, 1936.

For May 1937 the indicator stood at 103.8.

compared with $4,186 886 for the same period in 1936—an increase of nearly 60 per cent April exports were valued at $3 118 811 against $85 582 last year First ranking foreign market from a value standpoint was The Netherlands, which purchased seven planes valued at $636 500

Army Places Pursuit Order

A CONTRACT for 210 Pursuit planes, costing $4,113,550 was awarded July 6 to the Curtiss-Wright Corporation at its Buffalo plant. The plane is a low wing all-metal cabin monoplane, powered by one Pratt & Whitney two-row 1100 hp engine The contract largest for single place pursuits in years, combines the requirements of two years for this type of equipment

New School—

A Los Angeles educational project sponsored by aviation executives

IN AN AMBITIOUS AVIATION SCHOOL PROGRAM, California's new Aero Industries Technical Institute, Inc, is now taking enrollment applications for the fall semester which commences with the school's formal opening on September 1st With an investment in buildings and equipment of approximately $500 000, the school will have an initial capacity of five hundred students.

Courses of instruction feature practical preparation for aircraft factory employment with classes in machine shop, metal work, blue print reading, layout, welding, engine and instrument installation, inspection, jig work, and practical work with accessories, radio and electrical equipment, and miscellaneous tools. The full course covers five to seven months with daylight classes only, and no flying or engineering instruction being offered at this time

Hughes Men Organize

THE ENTIRE HOWARD HUGHES ENGINEERING PERSONNEL have gone into business as a group and will be known as United Engineering Service. Offices and drafting rooms have been set up at Union Air Terminal in Burbank Cal. The firm will carry on general engineering consulting work, but will specialize in aeronautical subjects, especially the design of airplane components such as retractable landing gears, flap operating mechanisms, and parts suitable for drop hammer production

Boeing Course Popular

BOEING SCHOOL OF AERONAUTICS reports immediate response to its recent announcement of the Boeing Air Transport Engineering and Practical Aeronautical Engineering Courses With the first class starting September 27, 1937, it lists as prerequisite the satisfactory completion of two years of engineering study in an accredited university. The course will cover two years of instruction and includes 1 176 hours of lecture work, with 2,388 hours of shop and laboratory work

Supplementing flight instruction, the Boeing school has recently purchased a Link Trainer to be used in connection with the Airline Pilot course, for instruction in instrument and radio beam flying

Bendix Starts Construction

BENDIX AVIATION CORP. has announced award of construction contracts for immediate start of building operations at Bendix, N J The major portion of ten buildings, providing 385,000 sq ft of floor space, will be completed by November These buildings will be on 100 acres which has been laid out for construction of this aviation city

Two thousand five hundred employees will work in the plant, although the available floor space for future expansion permits potential employment of 4 000 First unit in the new group will be a two-story administration building. Beyond that will be three buildings, each 60x600 ft for engineering, instruments, and electrical manufacture. Also planned is a general manufacturing structure 250 by 600 ft

Deliveries

***AVIATION'S** report of commercial airplane deliveries for the month ended July 1, 1937*

Purchaser and Number of Units	Type of Buyer*	Manufacturer	Model	Engine Make and Model
Aircraft Associates	Fixed Base.	Taylor	Cub J2	Continental A40
Aircraft Associates	Fixed Base.	Taylor	Cub J2	Continental A40
Air Industries, Inc	Fixed Base.	Ryan	STA	Menasco C4
Air Service Inc	Fixed Base	Taylor-Young	A	Cont. A-40-4
Airways, Inc	Fixed Base	Taylor	Cub J2	Cont.ental A40
Arkansas Aviation Corp	Fixed Base	Cessna	C37	Warner 85
Akron Airways	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Akron Airways, Inc	Fixed Base.	Stinson	SR-9-BD	Lycoming R-680-D6
Aviation Service Corp., Ltd E	Corporate	Monocoupe	90A	Lambert R266
Brain George E	Private	Taylor	Cub J2	Cont. A-40
Baily E. B.	Private	Taylor	Cub J2	Cont. A-40
Ball Howard H.	Fixed Base.	Beech	E-17 B	Jacobs L-5
Bayside Flying Service	Fixed Base.	Taylor	Cub J2	Cont. A-40
Bennett Air Service	Fixed Base.	Taylor	Cub J2	Cont. A-40
Bogacki Air Service	Private	Waco	ZGC-7	Jacobs L-6
Bole, Ernest C T	Private	Taylor-Young	A	Cont. A-40-4
Boswell, Mrs. Florence.H	Private	Cessna	C37	Warner 85
Bowman-Park Aero Co	Corporate	Cessna	C37	Warner 85
Brass Allen Aviation Ltd E	Fixed Base.	Stinson	SR-9-DD	Wright R-760-E1
Bridgeport Fly Serv	Fixed Base.	Taylor-Young	A	Cont. A-40-4
British North American Airways (2) E	Fixed Base.	Stinson	SR-9-FM	Wasp. Jr
Bromley-Richard N	Private	Taylor-Young	A	Cont. A-40-4
Burnham-Miller Fly Serv	Fixed Base.	Taylor	Cub J2	Cont. A-40-4
Burnham-Miller Fly Serv	Fixed Base	Taylor	Cub J2	Cont. A-40-4
Burns & Lamb Fly Serv	Fixed Base	Taylor-Young	A	Cont. A-40-4
*Byer Russel	Fixed Base.	Welsh	GW-6-M	Cont. A-60-4
Bristol Glenn	Private	Beech	E-17B	Jacobs L-5
Cassel City Fly Serv	Fixed Base.	Taylor	Cub J2	Cont. A-40
Cassel City Fly Serv	Fixed Base.	Taylor	Cub J2	Cont. A-40
Cardinal Fly Serv.	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Carlson Raymond	Private	Taylor-Young	A	Cont. A-40-4
Casey John F	Fixed Base.	Fairchild	24 R	Ranger 6-390-D3

Balance in Design

In ball bearing design, ball size, race depth and ring thickness determine life and capacity

Fafnir's larger balls carry greater load, make fewer revolutions per bearing revolution, with resultant longer life. Fafnir's deeper races also increase load capacity, and provide thrust capacity to a degree unusual in a radial bearing

Every Fafnir Ball Bearing has been developed to the point where high capacity and long life are inherent attributes of a perfectly balanced design

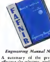
FAFNIR BALL BEARINGS

THE BALANCED LINE . . MOST COMPLETE IN AMERICA

BALANCED *for Maximum* PERFORMANCE

Consider the three ball bearing designs illustrated above In one, ring thickness has been increased beyond the necessary point, reducing ball size — and consequently, life and capacity In another, ball size is increased to the point where ring thickness is insufficient to insure strength

In the third (center) note how Fafnir, in pioneering the Maximum Type design, provided ring thickness adequate for strength, yet brought race depth and ball size to the proper point for maximum performance *Fafnir is the only manufacturer to provide this largest possible ball size throughout the full range of bearing sizes* The Fafnir Bearing Company, New Britain, Conn



Engineering Manual No. 35

A summary of the principles affecting the selection, application, and operation of anti-friction bearings — and particularly ball bearings — with a complete tabulation of characteristics, dimensions and capacities A copy will be sent you without cost

FAFNIR BALL BEARINGS

THE BALANCED LINE — MOST COMPLETE IN AMERICA

Purchaser and Number of Units	Type of Buyer*	Manufacturer	Model	Engine Make and Model
Central Alaska Transport	Fixed Base.	Taylor Young	A	Cont. A-40-4
Christensen, Hakon	Private	Waco	ZOC-7	Jacobs L-5
Cincinnati Aircraft Service	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Colby T. B	Private	Monocoupe	90A	Lambert R-266
Condit, Clifford	Fixed Base	Fairchild	"24" G De Luxe	Warner 86
Continental Air Lines (2)	Airline	Lockheed	12-A	PW Wasp Jr
Cooper, Price	Private.	Monocoupe	90-A	Lambert R-266
Cox, Jr., L. S	Private	Taylor	Cub J2	Cont. A-40
Cox, Everett S	Fixed Base.	Taylor Young	A	Cont. A-40-4
Crabtree S. B	Private.	Beech	E-17 B	Jacobs L-5
Cuno Engineering Corp	Corporate	Stinson	SR-9-ED	Wright R-760-E3
Curry Jr. Chas	Private	Taylor	Cub J2	Cont. A-40
Cutter Wm. P	Fixed Base	Fairchild	"24" G Std	Warner 85
D Autun, B S	Private	Fairchild	"45"	Wright Whirlwind
Davenport, R. M	Private	Taylor-Young	A	Cont A-40-4
Davis, A, B	Private.	Stinson.	SR-9-B.	Lycoming R-680-D5
DeFundi Aircraft Sales	Fixed Base.	Taylor	Cub J2.	Cont. A-40
Dorman, Kenneth R	Private	Monocoupe.	90A.	Lambert R-266
Downing, Frederick	Fixed Base	Taylor	Cub J2	Cont A-40
Drane, Hugh	Private	Stinson	SR-9-CD	Lycoming R-680-D5
Dusk Air Service	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Duell, Col. Holland	Private	Beech	E-17-B	Jacobs L-5
Dulgeman Barkev	Private	Taylor	Cub J2	Cont. A-40
Eckenberger E	Private	Taylor	Cub J2	Cont. A-40
Ethyl Corporation	Corporate	Beech	18A-53	2-320 Wright
Fadden, Mrs Ethel	Private	Fairchild	"24" H	Ranger 6-390-D3
Fera, Charles	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Fleck, Frank	Fixed Base.	Taylor	Cub J2	Cont. A-40
Fleck, Frank	Fixed Base.	Taylor	Cub J2	Cont. A-40
Fleet Aircraft, Ltd (2) E	Fixed Base	Waco	ZGC-7	Jacobs L-5
Fleetwing Flying Club	Fixed Base	Taylor-Young	A	Cont. A-40-4
Freeman Aircraft	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Furlong, B	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Galbreath, L. E	Private	Taylor	Cub J2	Cont. A-40
Gannett Co. Inc	Corporate	Stinson	SR-9-CD	Lycoming R-680-D5
Garlough Van H	Private	Taylor Young	A	Cont. A-40-4
Giovanelli C	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Goshen	Fixed Base.	Taylor	Cub J2	Cont. A-40
Gov't. of Guatemala (2) E	Gov't	Waco	VPF-7	Cont. W-670
Graham, William J	Private	Taylor-Young	A	Cont. A-40-4
Grossman, Darwin	Private	Taylor	Cub J2	Cont. A-40
Guinea Airways E	Airline	Lockheed.	Electra	P&W Wasp Jr.
Hall F C	Private	Lockheed.	12-A	P&W Wasp Jr.
Hangar Six, Inc	Fixed Base.	Taylor	Cub J2	Cont A-40
Hangar Six, Inc	Fixed Base.	Taylor	Cub J2	Cont A-40
Harte Flying Serv	Fixed Base.	Taylor	Cub J2	Cont. A-40
Hawker, Robert B	Fixed Base.	Taylor Young	A	Cont. A-40-4
Haselton, Ben P., III	Private	Ryan	S-T-A	Menasco C-4
Hearst, Randolph A	Private	Stinson.	SR-9-FD	P&W Wasp Jr
Henson Richard A	Private	Taylor	Cub J2	Cont. A-40
Hewland Dee	Fixed Base.	Welch	OW7M.	Welch 0-2
Hixson, John	Fixed Base.	Taylor	Cub J2	Cont. A-40
Hornaday Fayette	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Howard Earl	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Howe Samuel P	Private	Stinson.	SR-9-CD	Lycoming R-680-D5
Hudson Valley Aircraft Co	Fixed Base.	Taylor	Cub J2	Cont. A-40
Hylan Flying Ser	Fixed Base.	Taylor	Cub J2	Cont. A-40
Indiana Air Serv	Fixed Base.	Cessna	C37	Warner 85
*Ingalls, David	Private	Howard	DGA-6	Wright R-760-E2
Inter City Airlines	Fixed Base	Fairchild	"24" H	Ranger 6-390-D3
Jacobson, Joe	Fixed Base	Cessna	C37	Warner 85
Jersey Air Service	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Jones, Howard A	Private	Taylor	Cub J2	Cont. A-40
King Aircraft Serv	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Larsen, Hans P	Private	Fairchild	"24" G Deluxe	Warner 85
Lecomel, F M	Fixed Base.	Fairchild	"24" G Deluxe	Warner 85
Lindsey R. W	Private	Howard	DGA-6	Jacobs L-5
Lippold, H. C	Fixed Base.	Waco	YKS-7	Jacobs L-4
Littenberger A	Private	Stinson.	SR-9-B	Lycoming R-680-D5
Lockport Flying Service	Fixed Base.	Taylor-Young	A	Cont A-40-4
Louisville Fly Serv	Fixed Base.	Taylor	Cub J2	Cont. A-40
MacFadden B M	Private	Stinson.	SR-9-BD	Lycoming R-680-D6
Mahrer Roland	Private	Taylor	Cub J2	Cont. A-40
Mankato Aero Serv	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Mason, Henry L	Private	Taylor	Cub J2,	Cont. A-40
Mayer Charles W	Fixed Base.	Taylor-Young	A	Cont. A-40-4
McInnis, A. C	Private	Taylor	Cub J2	Cont. A-40
McLean Ltd., H. F	Corporate	Stinson.	SR-9-FM	P & W Wasp Jr
Miami Aero Corp	Fixed Base.	Taylor	Cub J2	Cont. A-40
Mississippi Flying Serv	Fixed Base	Taylor Young	A	Cont. A-40-4
Molyneux, Russell	Private.	Taylor-Young	A	Cont. A-40-4
Monsanto, D. B	Fixed Base	Taylor-Young	A	Cont. A-40-4
Moore Russell	Fixed Base	Taylor-Young	A	Cont. A-40-4
Montee and Clyde	Fixed Base	Beech	E17B	Jacobs L-5
Nassau County Police Dept	Government	Stinson.	SR-9-ED	Wright R-760-E3
Nicholas Bi F	Private	Waco	YKS-7	Jacobs L-4
Northern Calif. Waco Dists	Private	Waco	ZGC-7	Jacobs L-5
Nomura & Co. for Japan E	Corporate	Waco	YPF-7	Jacobs L-4
Organd, Leonard & Meneth	Private	Taylor	Cub J2	Cont. A-40
O. X. Flying Club	Fixed Base	Taylor	Cub J2	Cont. A-40
Cunard Thornton	Fixed Base	Beech	C-17-B	Jacobs L-5
Payson, I W	Private	Stinson	SR-9-B	Lycoming R-680-D-6
Peterson Paul	Fixed Base.	Taylor	Cub J2	Cont. A-40
Pure Oil Co	Corporate	Stinson.	SR-9 DD	Wright R-760-E1
Queen City Flying Ser	Fixed Base	Waco	VKS-7	Cont. W-670
Rauh, David	Fixed Base	Taylor-Young	A	Cont. A-40-4
Reed Paul	Fixed Base.	Taylor	Cub J2.	Cont A-40
Richmond Air Transport	Fixed Base.	Taylor-Young	A	Cont. A-40-
Roach Morton, Roach	Fixed Base.	Taylor	Cub J2	Cont. A-40
Robbins Co., H. C	Corporate	Waco	YKS-7	Jacobs L-4
Robbins Co., H. C	Fixed Base.	Waco	YKS-7	Jacobs L-4
Robbins Co., H. C	Corporate	Waco	YOC 1-5.	Jacobs L-5
Robbins Co., H. C	Corporate	Waco	ZOC-6	Jacobs L-4
Robbins Co., H. C	Private.	Waco	ZGC 7	Jacobs L-5
Rochester Fly School	Fixed Base	Taylor	Cub J2	Cont. A-40
Ross, Frank Jr	Private	Taylor	Cub J2	Cont. A-40
Salzman-Leonard, Inc	Private	Waco	ZGC-7	Jacobs L-5
Sanford Walter B	Private	Taylor-Young	A	Cont. A-40-4
Santa Maria Airlines, Inc	Private.	Stinson	SR-9-BD	Lycoming R-680-D6
Schmidt, Edward J	Private	Taylor	Cub J2	Cont. A-40
*Schrader Leonard J	Fixed Base.	Welch	OW-5-M.	Cont. A-40-4
Seidner, Jr., Ralph	Private	Taylor	Cub J2	Cont. A-40
Bem. Skyways	Fixed Base	Taylor-Young	A	Cont A-40-4
Shymaker, Wm. F	Private	Monocoupe	90A	Lambert R-266
Smith E. F	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Smith Flying Serv	Fixed Base.	Taylor	Cub J2	Cont. A-40
So. Carolina Aeronautics Com.	Government	Stinson.	SR-9-BD	Lycoming R-680-D6
Southern Air Services	Fixed Base	Taylor	Cub J2	Cont A-40
Southern Airways, Inc.	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Sperry Gyroscope Co	Private	Taylor Young	A	Cont. A-40-4
Spicer A J	Private	Beech	E-17 B	Jacobs L-5
Spring, Frank S	Private	Beech	E-17-B	Jacobs L-5
Springfield Aviation	Fixed Base.	Taylor-Young	A	Cont. A-40-4
St. Louis Airlines	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Standard Flying Serv	Fixed Base.	Taylor Young	A	Cont. A-40-4
Standard Oil of New Jersey (2)	Corporate	Lockheed.	12-A.	P & W Wasp Jr
Steinlaw's, Inc	Fixed Base.	Taylor	Cub J2	Cont. A-40
Stoner, Gottlieb	Private.	Cessna	C-37	Warner 85
Stolle, F	Fixed Base.	Taylor	Cub J2.	Cont. A-40
Stout, R. L	Fixed Base.	Taylor-Young	A	Cont A-40-4
Strong, Pritchard A	Private	Stinson.	SR-9-CD	Lycoming R-680-D-5
Susquehanna Fly Serv	Fixed Base.	Taylor	Cub J2	Cont. A-40
Texas Pipe Line Co	Corporate	Stinson.	SR-9-FD	P & W Wasp Jr
Thorne, Joe	Private.	Lockheed	12A	P & W Wasp Jr
Topping, Daniel R	Private	Beech	SE-17-B	Jacobs L-5
Towner Selby	Private.	Taylor	Cub J2.	Cont A-40
Tri-Boro Flying Club	Fixed Base.	Taylor	Cub J2	Cont A-40
Ungren Frazier Drlg. Co	Corporate	Cessna	C-37	Warner 85
Union Oil Co	Corporate	Stinson.	SR-9-FD	P & W Wasp Jr
Van Pelt, R. S	Corporate	Cessna	C-37	Warner 85
Vincent, Col. J. G	Private	Stinson.	SR-9-FD	P & W Wasp Jr
Waco Sales of New York Inc.	Corporate	Waco	DGC-7	Wright R-760-E1
Waco Sales of New York, Inc.	Corporate	Waco	ZGC-7	Jacobs L-5
Waco Sales of New York, Inc	Private.	Waco	EGC-7	Wright R-760-E2
Warner E Bishop	Private	Stinson.	SR-9-CD	Lycoming R-680-D5
Wart, J P	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Western Airlines	Fixed Base.	Taylor-Young	A	Cont. A-40-4
Whitaker, A. W	Fixed Base	Taylor	Cub J2	Cont A-40
Wiggins Airways, Inc. E. W	Fixed Base.	Taylor	Cub J2	Cont. A-40
Wilcox Oil & Gas Co H. F	Corporate	Beech	C-17 B	Jacobs L-5
Williams, Jesse G	Private.	Taylor-Young	A	Cont. A-40-4
Wilson, J A	Private.	Stinson	SR-6	Lycoming R-680-B6
Wings Field, Inc	Corporate	Waco	ZGC-7	Jacobs L-5
Wings Field, Inc	Private.	Waco	YKS-7	Jacobs L-4
Wolfe Asher	Private	Taylor	Cub J2	Cont. A-40
Yates, L. A	Private.	Fairchild	"24" G Deluxe	Warner 85
Young, Hardy	Private.	Waco	ZGC-7	Jacobs L-5

Asterisks (*) indicate previously unreported deliveries made prior to June 1, 1937 "E" indicates export.

Aviation People

Who's who and what they are doing

» Effective June 21, JAMES H. MCGRAW, JR. was elected president of the McGraw-Hill Publishing Co. to succeed MALCOLM MUIR, resigned. Mr. McGraw, Jr. continues as chairman of the board. Following his graduation from Princeton University in 1915, Mr. McGraw entered the service of the company and for twenty-one years has served actively in various posts connected with its publishing activities. After eight years of service with individual papers and groups of papers he entered the general management of the company as treasurer in 1923 and became executive vice-president in 1932. In 1935 he was elected chairman of the board to succeed JAMES H. MCGRAW, founder of the company.

In 1932 and 1933, Mr. McGraw served as president of the Associated Business Papers and in addition to his work in his own company he has contributed generously of his time and effort to the advancement of business paper publishing. Thoroughly grounded in the editorial tradition, he has applied himself aggressively to keeping the business paper abreast of what is best modern publishing practice from the viewpoint of both readers and advertisers.

» Alger-like is the rise of REAGAN C. STUNKEL. In May of this year we reported his appointment as assistant to operations manager of Braniff Airways. As we go to press, O. M. MOSIER, Braniff's vice-president, announces Stunkel's promotion to assistant to the vice-president. His new job makes him coordinator of all operations, maintenance and flight control for the line. Twenty eight years old, Stunkel started in 1925 as chief mechanic and relief pilot for Saline Airways, then on to Southern Air Transport, Gulf Coast Airways, Bowen Air Lines, American Airlines and Delta Air Lines. He has written numerous engineering articles.

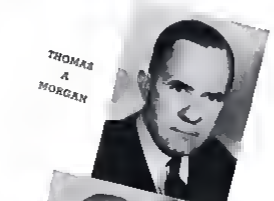
» Able TOM MORGAN, three consecutive terms helmsman for the Aeronautical Chamber of Commerce, turns his talents towards the success of the aviation division of the New York World's Fair. Heeding the call of GROVER A. WHALEN, Morgan has accepted the chairmanship of the Aviation Advisory Committee of the Fair, which committee will plan the events and exhibits depicting aviation's role in the "The World of Tomorrow," the theme of the Fair. THOMAS A. MORGAN is president of the Sperry Corporation, a Governor of the Aeronautical Chamber of Commerce, and a member of the Institute of the Aeronautical Sciences and of the National Aeronautical Association. He was at one time president of Curtiss-Wright Corporation (later chairman of its board), and president of North American Aviation. Mr. Morgan's committee will have the benefit of consultation with Howard Hughes, recently appointed the Fair's technical adviser on aviation.

» To our good neighbor, Canada, goes one of the industry's leading executives. PHILIP G. JOHNSON will supervise the organization of the new airways system of Trans-Canada Air Lines, as vice-president in charge of operations. Announcement was made by S. J. HUNGERFORD, chairman and president of Canadian National Railways, who is also president of the new air corporation. Other directors are JAMES Y. MURDOCK of Toronto, HON. WILFRED GAGNON, Montreal, H. J. SYMINGTON, Montreal, COMMANDER C. P. EDWARDS, Chief of Air Services, J. A. WILSON, Controller of Civil Aviation, G. HERRIN, Chief Superintendent, Air and Land Mail Services.

Entering Boeing Airplane Company twenty years ago, Mr. Johnson became superintendent of production, vice-president and general manager, then president of the Boeing company and of Boeing Air Transport Corporation (later subsidiaries of United Aircraft & Transport). He served as president of Pacific Air Transport, Varney Air Lines and National Air Transport. When, with Boeing Air Transport, they were consolidated as United Airlines, Inc., Mr. Johnson was made president. Upon the dissolution of United Aircraft & Transport Company Mr. Johnson became vice-president of Kenworth Motor Truck Corporation. In 1936 he was elected a director of Boeing Airplane Company and its subsidiary, Boeing Aircraft Company.

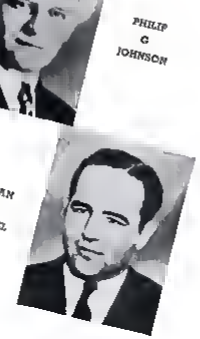
» W. P. SCRUGGS, JR., for some years past stationed at TWA's Washington office, has been made assistant to president JACK FRYE, replacing MILTON VAN SLYCK who has re-entered the Chicago newspaper field. Scruggs has been with TWA for nine years, in its traffic department and executive branch. He remains at the Washington office. Also at Washington will be A. MARTIN LOGAN, TWA's newly appointed National Executive Representative. Logan was formerly Philadelphia manager of General Air Express, division of TWA. In 1930 he organized Great Atlantic Airways, New York, and completed flight surveys of the route for projected trans-Atlantic passenger and mail service.

JAMES H. MCGRAW, JR.



THOMAS A. MORGAN

PHILIP G. JOHNSON



REAGAN C. STUNKEL

» In appointing LYLE A. BROOKOVER its General Sales Manager Chicago & Southern Air Lines, Inc. has plucked its man from the ranks of the fourth estate. Mr. Brookover was formerly associated with the Washington bureau of the Cleveland Plain Dealer. He later covered NRA and the various labor phases of the administration for United Press, and for the past two years has been Public Relations Adviser to MAJOR GEORGE L. BERRY, Coordinator for Industrial Cooperation. From his St. Louis office Mr. Brookover will direct public relations, advertising sales and promotional activities.

» Among the major appointments of the month is that of LESSITER C. MILBURN as Works Manager of the St. Louis Airplane Division of the Curtiss-Wright Corporation. Mr. Milburn's recent resignation as vice president of Glenn L. Martin Company terminated an association of twenty years. During that time he received design patents on the "Martin Bomber" and "China Clipper" and holds numerous patents for airplane mechanical devices. In his new position he will have charge of all manufacturing operations of the St. Louis plant. Mr. Milburn is a past vice-president and Charter Fellow of the Institute of the Aeronautical Sciences, a member of the NAA, S.A.E. Standards, and the Maryland Flying Club.

» The Radio Technical Committee for Aeronautics has elected as its new chairman W. E. JACKSON, who is Chief of the Radio Development Section, Bureau of Air Commerce. The committee was organized in 1935 under the auspices of the Bureau of Air Commerce and is composed of representatives from government agencies concerned with radio, and of manufacturers and users of radio.

» The Pratt & Whitney Aircraft division of United Aircraft Corporation has appointed JOHN J. BORRUP factory manager, succeeding BENJAMIN H. GILPIN, resigned. Succeeding Mr. Borrup as general superintendent will be DANIEL MACGREGOR JACK, heretofor machine shop superintendent. CHARLES LAWSON moves up to the post vacated by Mr. Jack, and G. H. D. MILLER becomes assistant to the factory manager. Both Mr. Borrup and Mr. Jack have been identified with Pratt & Whitney since it was founded in 1925. From 1906 until the early war days Mr. Borrup was associated with D. J. BROWN, now president of United Aircraft, in the Crane Motor Car Co. When this organization was absorbed by Wright-Martin Corporation, Borrup was in charge of manufacturing the first Hispano-Suiza aeronautical engines built in the United States. He continued with the company and its successor, Wright Aeronautical Corporation, until joining Pratt & Whitney. Mr. Jack became associated with Mr. Borrup in the Crane Simplex and Wright-Martin companies. Mr. Lawson has been with Pratt & Whitney for the past nine years as general foreman of the machine shop. Mr. Miller has been with the company since 1935 as night superintendent.

» Innovation by TWA is the establishment of its News Bureau, replacing the former public relations division. Heading it is CLANCY W. DAVHOFF, former public relations manager at Los Angeles, now to be stationed at Kansas City. Davhoff was at one time news manager on the Pacific Coast for Western Air Express and for a short period during 1935 was with Eastern Air Lines. The four news bureau regions already in operation will be continued with the following managers in charge: DON BLACK, Los Angeles, Mr. DAVHOFF, Kansas City; WILLIAM WESTLAKE, formerly of the Chicago Herald & Examiner, Chicago; HARRIS HULL, New York City. At the same time TWA announced that EARL COLGROVE, formerly Pacific Coast manager for a national photo syndicate, will be the system's photographer.

JOHN J. BORRUP

DANIEL MacGREGOR JACK

» Over at the New York Times' editorial office a new set-up for the automobile and aviation news departments is now in effect. For the past eight years REGINALD M. CLEVELAND has been aviation editor. On the death of JAMES O. SPEARING six months ago, Cleveland was appointed automobile editor as well. Now his entire time will be devoted to the automobile department while JAMES V. PIERSOL takes on aeronautical news. Mr. Piersol is a pilot and for the past ten years has been on the *Detroit News* holding the combined jobs of pilot reporter, aviation director and photographer.

» Within ten days Britain lost two of her most prominent aviation figures. On June 11 REGINALD JOSEPH MITCHELL, director, chief engineer and designer of Supermarine Aviation Works, died at Southampton. Among his designs were the Supermarine Amphibian, Sea Lion, Seagull, S4, S5, S6 and S6B, Southampton Flying Boat, Scapa and Stranraer. On June 22 death claimed Sir ERIC GEDDES, chairman of Imperial Airways Ltd. First Lord of the British Admiralty during the World War and later Minister of Transport his active connection with aviation began in 1924 when he became chairman of Imperial Airways. He was one of the first to develop commercial aviation between England and the Far East.

» Comings and Goings: To the U. S.: GEORGE MARCANO of Maracay, Venezuela, as official representative of his country to study aviation developments. . . . BERYL MARKHAM, England's "Flying Mother," to buy a plane. . . . KAMAL ELOUI, Managing Director of MISR Airwork of Egypt, also shopping for ships for his air line. . . . MICHEL WEHAULT, HENRI DESBAUERES, HENRI ZIEGLER, Officials of the French Air Ministry, engaged on a survey tour of the industry. . . . GJOSKEN N. JAKOBSEN, woman flier from Narvik, Norway, in this country on a business trip. . . . From the U.S.: JAMES F. LINCOLN, in whose honor was created the James F. Lincoln Arc Welding Foundation, to England to give a series of talks at the invitation of various engineering societies. . . . HARRY ASHWORTH for several years with Ames Aircraft Corporation to Colombia to set up for that government an office for the procurement of airplane instruments and equipment. . . . FUMITAKA KONOYE, son of the Premier of Japan, back to Japan part of the way by TWA. . . . Col. J. CARROL CONE back from Europe May 26 sailed for England.

Flying With One Foot on the Ground

(*Continued from page 25*)

Obvious it is that proper operation of the flight plan depends on furnishing pilots with ultra-reliable weather information It is for this reason that TWA has developed its own weather reporting services so extensively And, in order to check definitely on the performance of its weather peophets, the same scheme has been applied to weather reports as was originally applied to flight plans. After studying all available data, the meteorologist prepares a weather prediction for the pilot about to make out a flight plan This is furnished in writing, and on the same form are parallel columns which are filled in by the pilot during flight and by certain ground stations which give the actual conditions at the time and places indicated, to be compared directly with the estimated conditions As with pilots who deviate consistently from flight plans, the weather men must explain satisfactorily any marked deviation in the behavior of the weather from the conditions that they themselves have predicted.

Now all this is good, but it is not good enough to satisfy TWA officials Once pilots are in the air, following their flight plan and the meteorologist's weather predictions, they must be kept advised of any changes that occur Commonly, the clearances for all flights and the responsibility for maintaining contacts with pilots in the air for the purpose of issuing instructions as to procedure rest in the hands of the line dispatchers Dispatchers nowadays must meet certain specifications laid down by the Bureau of Air Commerce But until recently, dispatch personnel has generally been considered as a group of super clerks that filled out papers and told airplanes when to come and go as a more or less routine job. Many such dispatchers were youngsters who had actually come along from clerical or other non-flying positions

Frequently pilots in the air suspected that the dispatchers didn't know what they were talking about, or at least did not know how to interpret properly the information that was given to them.

Again, as a direct result of his own flying experience Jack Frye was among the first to conceive of the man-on-the ground the dispatcher as the third member of an airplane's crew A properly trained dispatcher, sitting apart from the immediate stress and strain of flying an airplane, and with all possible forms of information at his disposal, has an opportunity to sit down and figure things out in a way that is not possible for the pilot with his many flying duties Thus the old joke about flying with one foot on the ground could become an accomplished fact But the foot-on-the-ground must have the complete confidence of his flying crews, and Frye saw immediately that the men who were most highly qualified for such work, and the men in whom other pilots would have the most confidence, would be first pilots of long experience themselves, men who were thoroughly familiar with the routes to be flown, the weather to be expected over them, the equipment used and all the problems involved. So he called in a dozen or so of his best pilots and made chief dispatchers of them.

Now this was a rather shocking idea to other airline executives. They said—'Why put a $10,000-a-year man on a $2500 job?" "But," said Jack, "who said that dispatching was a $2500 job? Why isn't a job that shares responsibility for the safety and well-being of a ship, its passengers and crew on the same general level as a job of actually flying it?" It seemed only reasonable to him that competent dispatchers should be paid at the same general rate as competent pilots

And so it is working out. For example, we find such names among TWA top dispatchers as

"Andy" Andrews, now stationed at Newark, who taught himself to fly about 1915 and has been at it ever since to a total of 12,500 air hours

Joe Bartles at Columbus, who, with "Tommy" Tomlinson, recaptured for the U S many world's records in the old DC-1

Lamar Nelson, onetime fighting pilot and graduate aeronautical engineer.

Ted Weaver, another million miler, with TWA and its predecessors since 1929

Such men *know*, and the pilots in the air know that they know—and so they fly their routes with perfect confidence in the judgment and ability of the third member of the crew who is on the ground

TWA has pioneered also in other directions For example, it early recognized the importance of centralized and standardized maintenance procedure and built its great overhaul shops at Kansas City several years ago, shops that have served as a model for many other airline operators both at home and abroad Walter A. Hamilton, former chairman of the Interline Committee on Maintenance, and winner of Aviation's Maintenance Award (see AVIATION, Feb 1937), has been in charge for many years Also the "over-weather" work which has been carried on both on the ground and in the air, under the direction of energetic "Tommy" Tomlinson, (Lt. Cmdr. U. S. Naval Reserve) has been pointing the way toward tomorrow's substratosphere transport. (See AVIATION Dec. 1936) Engineers and operations men of the line have made great contributions toward the specifications of such aircraft as the Douglass DC-2, DC-3, and DC-4, as well as the new Boeing 307 The Radio Department has also turned in outstanding work in the development of new forms of equipment among them the recently developed shielded loop antenna

Transcontinental & Western Air came into being early in 1928 when a group of Eastern bankers and railroad executives met with Colonel Charles Lindbergh to lay out plans for the first Transcontinental system The Colonel's activities in the early days when he supervised all technical details gave rise to the use of his name in the present company's trade-mark The first schedule of Transcontinental Air Transport (the parent company) was flown on July 8, 1929 It was, actually, a combination air and rail travel, with railroads carrying the passengers at night and the airplanes in the daytime

About the same time Western Air Express, flying between Salt Lake City and Los Angeles was formed, and also Jack L. Maddux began operations between San Francisco, San Diego and Phoenix, Ariz When, in 1930, the Post Office asked for bids on a transcontinental trunk line, a combination of the three services was effected and the present Transcontinental & Western Air, Inc, came into being The contract was let to TWA and first schedules were flown on October 25, 1930

A variety of equipment was in use during the early years, but beginning in late 1933, the line has adopted Douglas transports into which a large share of TWA's operating experience

(*Turn to page 75*)

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Furthermore, it is entirely new in principle and self-contained—has no wandering separate pins or washers Just an integral, self-locking ring or floating thread—that works on the brake band principle—clinches it tight at the exact degree of adjustment desired.

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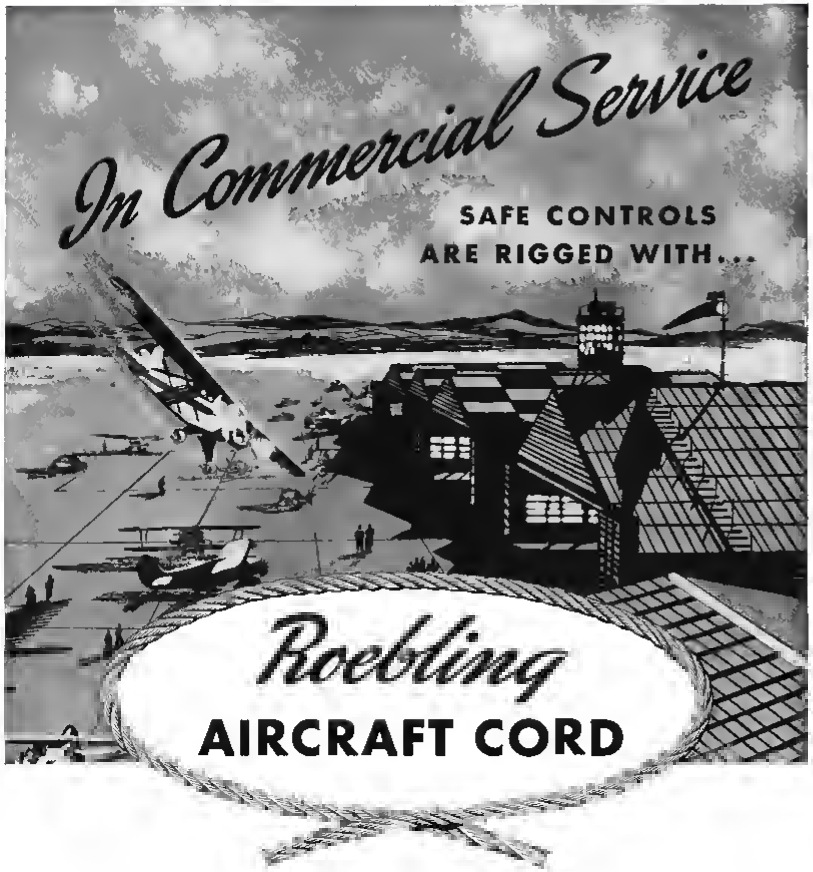

STEP by step, the remarkable progress of commercial flying has been matched by increasing demands on aircraft materials and accessories. To keep step with this development, Roebling Aircraft Cord has been continually improved... to provide the maximum of control safety. As a result, the large majority of commercial plane builders equip their ships with Roebling Control Cord.

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JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N. J. *Branches in Principal Cities*

KEEPING PACE WITH AN INDUSTRY WHOSE WATCHWORD IS PROGRESS

(*Continued from page 72*)

was put in the form of specifications. This year the line has been re-equipping by substituting the Douglases of a club and a club-sleeper type for the older DC-2s and, as mentioned above, has now a share in the development of some much larger 4-engined aircraft both in the DC-4 and in the Boeing 307.

The present TWA organization includes a little group of men who actually grew up together in the business. President Jack Frye, Vice-President Paul Richter, and Maintenance Superintendent Walt Hamilton, have worked together since the very start of the operations. Later in the company's history came John Walker, now 37, vice-president in charge of traffic. He was formerly with Greyhound Lines as traffic manager. He is an enthusiastic private pilot-owner and quite recently he purchased a new Monocoupe. With him as righthand man is Assistant General Traffic Manager Harris Beck.

In a picture on one of the preceding pages, three of TWA's present operating heads are shown together with "Tommy" Tomlinson, then of the United States Navy, but who now is associated with them, as assistant to the vice-president and is in charge of all experimental flying. All of these men are experienced pilots and are qualified as flight officers.

The same is true of most of the other top operating personnel. Superintendent of the Eastern region, Larry Fritz, and Steve Welsh, of the Western region each have S A T and Flight Captain's ratings. All the division superintendents, including Pat Gallup of the Atlantic division, John Collings of the Eastern division, A. D. Smith of the Mountain division and L. W. Goss of the Pacific division, still can qualify as flight captains or as first officers. This is in line with a definite policy that all operating executives must be thoroughly familiar with the problems of the pilots who fly the line.

Aviation Goes to a Party

(*Continued from page 29*)

tainous Sonora, once to famed Coronado Beach, and once into lower California to Ensenada.

This group has found that there really is something in the "flying for fun" idea. They were all tired of aimless flying about airports and hit upon the week-end tours as the answer to many a private owner's problem of getting the most out of his airplane. After all, private plane owners are people, and people like to go places together, especially if the company is congenial.

What works well one place may work just as well in another. Take a map of the United States and from any major center of population, draw a circle of a radius of 300 miles. From Maine to California and from the Lakes to the Gulf there is scarcely a large city of the United States but has a dozen major pleasure resorts within that 300-mile circle. The airplane, properly used, can bring the nation's playgrounds into the backyard of the average private pilot. And right here is the foundation for the greatest potential boost for private flying in the history of the sport. Here is a field where an ounce of organization will yield a ton of results.

And a business that is not "small potatoes," either. The Aviation Country Club of California has piled up a total of 1587 air-hours and some 475,000 passenger miles in the last year. This nice little bit of flying used up over 19,000 gal. of gasoline and close to 500 gal. of oil. Private planes that might otherwise have been sitting idly in hangars collecting dust had to be serviced and maintained to participate in these many flying hours. Charter operators have found opportunities for full-load week-end trips for these tours. Airplane dealers find them the best possible way of demonstrating their products to prospects. Industrial plane owners (such as the oil companies, the airplane and engine manufacturers, etc.) find such tours a natural and profitable way to join in with the activities of those who make their business possible.

Although other aviation clubs and air tours have been organized in other parts of the country, few have enjoyed the success of the Aviation Country Club of California. It was the brainchild of Wally Tinn and resulted from his calling a meeting of a group of 25 private pilots in February, 1936. Basic ideas were to keep organization loose, costs low and to promote the democracy among membership. Voting members were limited to pilots or plane owners with an associate membership open to others. Charter initiation fee was $5, with a $10 fee for late members. There have been no dues and no assessments. Officers of the organization work without salary.

Activities so far have been confined entirely to tours with no effort at other social affairs. Beside the four trips staged last year, numerous shorter and more informal tours have been set up whenever several members can conveniently get together. It speaks well for the whole organization that at the end of its last fiscal year it was solvent (with more than $500 in the bank), and that in all the flying there has been but one forced landing which involved no damage to equipment or no injury to passengers.

As a matter of fact, on all tours *safe* flying is stressed above all else. Anyone violating Bureau of Air Commerce rules or rules of just plain, ordinary good flying sense is disbarred from participation in future tours. No stunting is permitted and there is no attempt at any sort of air show at the port of destination. Contests are built around navigating skill. Usually pilots are required to state their cruising speed in advance, the winner being the one who holds his average for the tour closest to his predetermined figure. On the Del Monte tour, all pilots were required to fly over five check points which were identified for them only by latitude and longitude on sheets handed out at the time of take-off. Earl Gilmore, president of the Gilmore Oil Company of California, with Charles LaJotte as co-pilot, was winner at Del Monte.

Total membership in the California Aviation Country Club has grown to over 120 and a permanent club house is now being considered for the near future as the natural outgrowth of the success of the first year's operations. And the fame of its activities is spreading, for scarcely a week passes without inquiries coming into headquarters from other points of the United States for details of organization and operating program. If such interest continues there should be a nation-wide blossoming of the "flying for fun" program as developed by the Southern California group. With a chain of such clubs operating across the country, it is not difficult to envision the advantages of mutual cooperation among such clubs to stage special tours and air rallies on a scale far surpassing anything that has been contemplated to date.

What Plane Shall We Buy?

(*Continued from page 35*)

per hour of operation to care for minor crash or damage incurred under the 10 per cent deductible clause.

The cost of fuel in domestic operations varies to a considerable degree, averaging from 8 cents per gal to 30 cents or more per gal. depending on the distributing point, the quality or octane rating and the local taxes 17 cents per gal. is assumed here

The cost of oil will vary from 6 to 12 per cent of the fuel cost and a figure of 10 per cent of the fuel cost is assumed for present purposes

Pilot cost on scheduled operations will average from six to eight thousand dollars per year for approximately 1,000 hours of flying. Co pilots will average from two to three thousand dollars for the equivalent hours of flying. A figure of $10,000 for the pilot crew per year or $10 per hour is assumed.

A factor which is generally of utmost interest to the operator is that of maintenance and overhaul costs of their equipment. These costs while normally part and parcel of the same thing, can be segregated conveniently to effect better appreciation of their individual influence. Thus in this analysis, the overhaul and maintenance cost are individually estimated for both plane proper and engine.

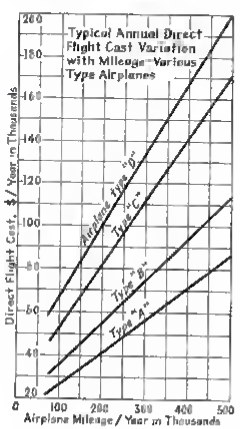

Figure 2

A current opinion is held by many that the modern all-metal airplane requires no *overhaul*, but that it can be continuously *maintained*. This is only partially true, and it would appear that all aircraft units or equipment could profitably be removed periodically from service for enough time to enable the unit to be completely disassembled, inspected and overhauled.

The frequency with which this operation is performed will vary with different types of equipment, but will range from twelve to eighteen months. The length of time for the operation will vary from two weeks to six weeks. Few comparative data are available but indications are that a figure of say, 5 per cent of the initial cost of the equipment per year, approximates the cost of overhaul. Overhaul costs on air transport operations are incurred whether the equipment is used extensively or moderately. Controls, landing gear, accessories etc. must for safety's sake be periodically completely inspected and it is necessary that they be completely broken down, disassembled and cleaned.

Maintenance costs vary in some proportion to the size of the airplane, —probably somewhat less than directly. Analysis for various operators indicates the following formula as one possible approximation

Aircraft maintenance costs ($/hr) = 0.0006/pound of weight empty.

Engine overhaul costs vary with the type and size of engine, the overhaul period, and only to a small degree among the various operators. Small engines (200 to 300 hp.) will average $1 per flying hour and large engines (700 to 900 hp.) will run $1.60 to $2 per flying hour.

Engine line maintenance will average about a third of the overhaul cost per hour or from, say, 40 cents to 65 cents per flying hour.

To illustrate these cost hypotheses four different size airplanes were chosen, all of which are essentially of the same type of construction and outstanding in their particular size category. They are termed Types A, B, C, and D. Table I gives the pertinent operational data required for our cost analysis.

Consideration of the cyclic variations of transport operations dictates the use of a fiscal year, as the accounting period.

Cursory examination indicates that one of the largest variables in the annual cost of an equipment is the intensity with which it is used. The annual "fixity" of such cost items as aircraft depreciation, insurance reserves and aircraft overhaul very markedly influence the unit cost per hour, per mile or per ton-mile. For this reason it is necessary to estimate each piece of equipment for intensive as well as moderate usage annually.

The basic mission of all air transport operations is the movement of loads for certain distances or mileages. In the following examples costs are determined on an annual mileage and ton-mileage basis, and for convenience these are estimated at even hundred thousand miles between one and five hundred thousand miles per year. It is found that the annual direct cost varies with usage or mileage as a straight line and hence for all practical purposes, it is satisfactory to estimate costs at say 200 or 250,000 miles per year and interpolate intermediate mileages.

This procedure is developed in Table No. 2 where the detail cost items are tabulated for each of the four types of airplanes. The resultant annual total dollar costs with respect to annual mileage have been graphed in Fig. 2. In addition, airplane Type C is separately graphed in Fig. 3 and on it there is illustrated the variation of the detail cost items.

The basic criterion for the transport efficiency of an equipment being the cost to carry a given load a given distance, we will use for the purposes at hand the cost to move one ton one mile. To determine this ton-mile cost it is first necessary to obtain the operating costs per airplane mile and then by dividing this per-mile cost by the maximum capacity tonnage of the airplane, obtain the capacity ton-mile cost.

Referring to Table II, it is obvious that by dividing the annual cost by the mileage operated gives the cost per airplane mile. This is graphed in Fig. 4 for the several airplanes.

The quantity of fuel required for a given range very materially affects the net pay load capacity of an airplane and hence the ton-mile cost. The net pay-load data given in Table I are graphed in Fig. 5. It will be noted that all of the airplane types have been dealt with equally from a weight standpoint, namely two pilots,

(*Turn to page 79*)

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radio, pyrotechnics, fuel, oil and sufficient fuel have been provided for each of the airplanes for the stated mileage range. The fuel consumption has been figured on a uniform basis of one-half pound per brake hp per hour at 65 per cent power at 5,000 ft altitude in all cases.

It will be noted that the fuel capacity with standard tanks falls short in each case of the 1,000 mile range, hence additional tankage would be required to meet the long range requirements. Such tanks would influence the capacity payload as illustrated by the dotted line in the Type C airplane graph, reducing the net payload by 80 to 120 lb. total. For the purposes of

TABLE II

Annual Direct Flight Cost—Various Type Airplanes

	Type A		Type B		Type C		Type D	
Operating miles/year	250,000	500,000	250,000	500,000	200,000	500,000	200,000	500,000
Operating hours/year	1,510	3,020	1,625	3,250	1,340	3,350	1,310	3,260
Depreciation, airplane	$5,600	$5,600	$8,000	$8,000	$12,000	$12,000	$16,400	$16,400
Depreciation, power plant	3,900	7,600	6,500	13,000	8,920	22,300	10,000	25,000
Reserve, crash, minor	1,079	2,158	1,690	3,380	2,144	5,360	2,751	6,846
Reserve, crash, washout	3,575	3,474	5,200	5,200	8,000	8,000	10,500	10,500
Fuel	8,985	17,970	11,960	23,920	17,540	43,851	21,713	54,034
Oil	898	1,797	1,196	2,392	1,754	4,385	2,171	5,403
Pilot and copilot	15,100	30,200	16,250	32,500	13,400	33,500	13,100	32,600
Overhaul, airplane	1,400	1,400	2,000	2,000	3,000	3,000	5,250	5,250
Overhaul, engine	3,020	6,040	3,900	7,800	3,750	9,380	4,190	10,432
Maintenance, airplane	3,823	7,646	6,166	12,332	9,808	24,522	12,025	29,926
Maintenance, engine	1,184	1,184	1,300	2,400	1,340	3,350	1,310	3,260
Total	$48,286	$85,998	$64,162	$113,124	$81,656	$169,648	$99,410	$199,651

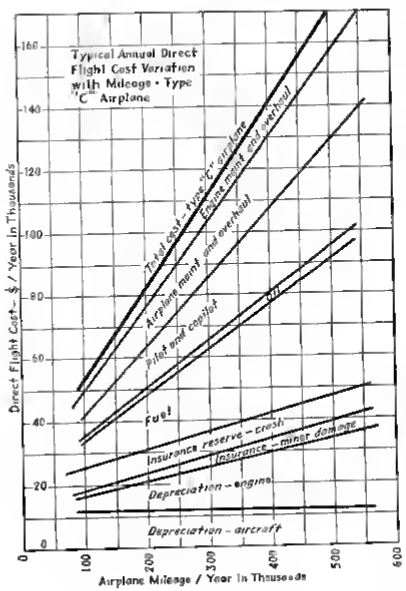

Figure 3

Cost Assumptions

Depreciation, airplane	5 year life — 20% Initial cost airplane less power plant/year
Depreciation, engine	3,000 hour life each engine — 0.00033 Initial cost power plant/operating hour
Reserve, crash, minor	0.00002 Initial cost airplane/operating hour (normally included in 10% deductible clause)
Reserve, crash, washout	Attrition — 10% Initial cost airplane/year
Fuel	$0.17/gal including tax.
Oil	10% fuel cost.
Pilot and copilot	$10.00/operating hour (1000 hours/year)
Overhaul, airplane	5% Initial cost/year
Overhaul, engine	$1.20–$1.60/operating hour
Maintenance, airplane	$0.0006/pound airplane weight empty
Maintenance, engine	$0.40 to $0.60/operating hour

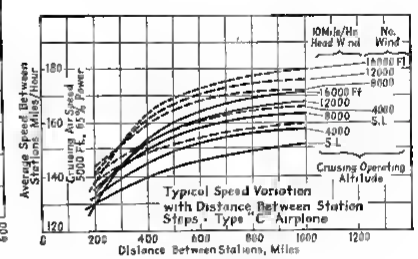

Figure 8

this discussion this reduction will not be accounted for

The significant influence which the carriage of a quantity of fuel for long range has on the operating cost is only slightly greater than the influence that the frequency of stops or distance between stations has on the operating speed and cost.

The time required for taxiing from the station to the end of the runway, checking the functioning of the engine, taking off and orienting the aircraft on a given course at the operating altitude and the reverse causes an appreciable reduction in the average speed between stations. Thus in the examples given in the discussion for Type C airplane the true cruising air speed of 175 m p h at 5 000 ft would be reduced to 142 and 168 m p h. for station distances of 200 and 1,000 miles respectively.

Typical variation of average speed with station distance is graphed in Fig 6 for Type C airplane when operated from sea level airports and at operating altitudes indicated.

For the purposes of this discussion, uniform 85 per cent of the cruising true air speed is used to determine the average station to station speed. This loss factor is generally disregarded by equipment manufacturers but to the operator it is a very real consideration inasmuch as his overhaul, pilots pay, engine depreciation etc., are accumulating whether the equipment is climbing, maneuvering or bucking head winds.

A summarization of the various factors and cost variations can be most illustratively expressed in a graph of ton-mile cost against capacity payload per schedule. This has been done in Fig 1, in which direct visualization is had of the influence of the size of equipment and the annual usage and the fueling range for the four types.

Indirectly, of course, the influence of operating speed, distance between stops, operating altitudes, initial price, type of equipment, operating costs, etc., has been evaluated in the foregoing tabular part of the analysis.

Study of Fig. 1 leads to rather interesting conclusions, the first of which is that the larger the equipment the lower the ton-mile cost of operation or the higher the transport efficiency. This is especially marked in the lower payload or size categories, whereas in the higher categories, the ton-mile cost of operation takes on an asymptotic location around $ 10 per ton-mile or $.01 per passenger-mile.

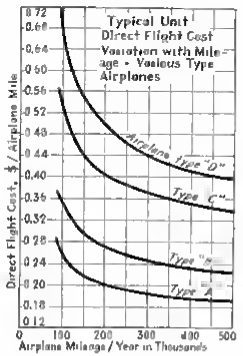

Figure 4.

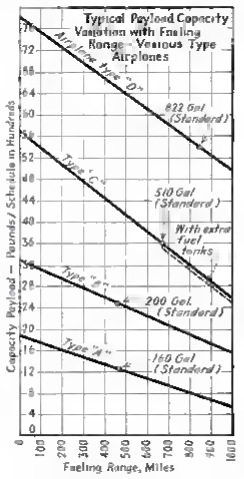

Fig 5—Fueling range-miles. (Based on average speed between stations of 85 per cent cruising air speed at 85 per cent power, 5,000 ft. altitude and 0.5 lb/bhp/hr consumption.

The above costs are all based on capacity loads, that is it is assumed that the entire capacity load is available and offered. In practice it will be obviously impossible to always obtain a capacity load. In such a case the cost of operation per ton-mile will equal the capacity ton-mile cost divided by whatever the available load factor happens to be. Take for example, Type D airplane, operated at, say, 500,000 miles per year with fuel aboard for a 600-mile range. The direct flight cost is indicated at 13 cents per ton-mile for 3.05 tons capacity load, or 40 cents per airplane mile. If the available payload on the average equalled only two tons per schedule or a load factor of 65 per cent, then the actual cost of transport would equal 13 cents divided by 65 per cent or 20 cents per ton-mile, or again for 2 tons, 40 cents per airplane mile.

In such case, obviously, a smaller airplane such as Type C would be more suitable in view of the operating cost for a capacity load of two tons at 500,000 miles per year and 600 miles fueling range being only 18 cents per ton-mile or 36 cents per airplane mile.

Considerable judgment is required to determine the probable variations in available loads per schedule. A large airplane operated at low load factor inherently costs more to operate than a small airplane operating at an equal load but at its capacity load. The inherent low cost advantages of large equipment can only be taken advantage of if the large loads are available per each schedule.

Another interesting indication given by Fig. 1 is that the advantages of high intensity of annual usage of the equipment reaches a stage of "diminishing returns" around 400,000 miles per year. It would appear that little is gained costwise by trying to get more than say 400,000 to 500,000 miles per year which is equal to an average of eight to twelve hours per day per airplane. This is fortunate as it trends toward a more conservative operating practice inasmuch as more time on the ground will favor better maintenance.

Transporting fuel for long hops is expensive especially in small airplanes where the fuel load becomes a large proportion of the useful load. Inherently small airplanes are most efficient on short hauls whereas large airplanes retain relatively high efficiency on long as well as short hauls.

The inherent advantage of large over small airplanes costwise is much less marked when fueled for short hauls than when fueled for long hauls.

In a later article the writer will try to work out a number of variations of some of these factors, especially indicating the influence of the cruising speed on the cost and payload.

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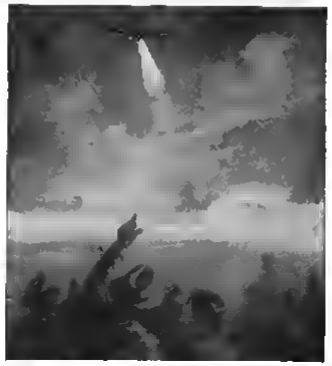

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Continued on pages 87 and 88

Planes, Engines & Parts For Sale

REARWIN SPORTSTER, LeBlond 70 good condition, new prop, brakes, motor only has 250 hours. Price $1600.00 Can finance Inter City Flying Service Municipal Airport, Fort Wayne, Indiana. No 1

CURTISS FLEDGLING Challenger 185 excellent condition $750.00 Extra motor complete, needs overhaul $175.00 Volgeneu, 15 Orchard Place Buffalo New York No 2

LATE 36 WACO Custom Cabin 285 Wright Automatic valve lubrication, Hamilton Controllable Prop Special upholstery complete hand rubbed finish Radio Compass Westinghouse 20 watt Transmitter, generator, landing lights, log light, bank and turn, rate of climb directional gyro Kollsman Sensitive Altimeter, large Kollsman compass, suction gauge Ice warning, Carburetor temp Chronoflight clock 100 gal tanks wheel pants, blind flying hood. little time like new No 3

EASTMAN Aero Camera $150 Standard J 1 $250 Curtiss M F Flying Boat, $500 Wm Long 172 Broadway Lorain Ohio. No 4

FAIRCHILD "22", Wright Gypsy 100 hours 185 hours since engine major overhaul, excellent condition good training ship 1936 Fairchild "24" Ranger beautiful condition, 230 hours, completely equipped for blind flying engine just major overhauled two-way radio landing lights etc., priced to sell Custom Cabin Waco Aircr 225 high compression continental engine fully equipped, big gas tanks 330 hours flying time, priced low. DuPont Airport Wilmington Del No 5

WACO 1936 Custom Cabin lights flares, clock, bank and turn, climb radio steel prop, 5 place special maine grey and red, 285 Jacobs, 110 hours, looks like new ship never scratched Waco A stripped hand rubbed finish, red and silver Warner 125 154 hours Parkersburg Flying Service, Parkersburg, W Va No 6

AMERICAN EAGLE—long nose OX-5 Completely rebuilt and recovered New upholstery cockpit floors, windshields control wires. Motor overhauled new propeller Frank Headley Jr Lincoln Park N J No 7

NEW AIRPLANES $75.00 down, easy payments. 700x4 Air Wheels with hubs $16.00 per set Propellers $2.50 up Send 25c for information Universal Aircraft Fort Worth Texas. No 8

1935 SR-6 privately owned Stinson Reliant—NC 15122, $5,885, cost nearly $9,000 with extras, including standard instruments plus Kollsman sensitive altimeter; Smith controllable propeller, 100 gallon tanks flares landing lights RCA Radio, turn and-bank red and cream finish with matching red leather upholstery purchased new from Stinson September 1935 never cracked flown by one pilot only maintained without regard for cost used for personal travel only M Reynolds 542 South Dearborn St Chicago Ill No 9

CHALLENGER ROBIN A1 condition $750. Whitelsey Avian, just rebuilt and majored $800, Fairchild 22, A1 condition $1250; Fairchild 21, majored and perfect shape $1150; Lambert Monocoupe, majored $2200 Fleda Robin, and other parts Aircraft Brokerage Flushing Airport Flushing L I No 10

LOCKHEED VEGA 6 place Wasp Engine Like new Motor and complete airplane rebuilt short time back. Small amount time never been on airline Bargain. Austin Municipal Airport Austin, Texas No 11

B17L—1935 Beechcraft equipment 225 H P Jacobs engine—metal propeller landing lights flares, flight instruments Color white, black trim. Demonstrator total hours approximately 250 Price $6,000 Air Travel and Sales, Inc., 9835 Yorkshire Road, Detroit, Mich No 12

ENGINES AND PARTS for sale Liberty 400 h p., Hispano E 180 h p., also quantities of Pratt & Whitney, Wright, Curtiss and Packard engines The Vimalert Company, Ltd, 881 Garfield Ave Jersey City, N J No 13

STINSON TRI MOTOR: Model U in A1 condition equipt with latest type 600-watt public address system of unusual power and tone Exceptional money maker for right party Present owner has other interests Will sell at bargain or trade for high grade cabin airplane F.S. 381 Aviation, 330 West 42nd St, New York City No 14

STINSON TRI-MOTORED T New 1931 Just relicensed 3 Lycomings R680 215 H P Wings recovered propeller etched, A1 condition Air wheels, electric starters flares, landing lights bonded for radio Best cash offer or trade Can finance Adams, P O Box 1174 Hartford Conn No 15

"Classified" INDEX
August, 1937

STINSON TRIMOTOR U and T, Pilgrim parts, Hamilton Standard adjustable propellers, Magnetos, Carburetors Ignition switches J5 and Waco B cylinders, Air speed indicators Air temperature gauges Altimeters, Tachometers. General Aeromotive Corporation Municipal Airport, Cleveland Ohio No 18

SALMSOM EAGLET Ship and motor just overhauled New wings and extra prop Fuselage recovered $650 D H Gypsy Moth motor and ship just overhauled Semi airwheels and wheel pants, reserve gas tank and fuel pump Blind flying instruments and ship just licensed. Make offer Might consider trading or bigger and faster job Paul Gingrich, Main Line Airport, Malvern, Penna No 17

ZENITH Z-6-B 7PCLB "Wasp" C-1 Just recovered hand rubbed finish, new seats and upholstery Repair job cost over one thousand Licensed in June, 1938 (Take-off run with full tanks and 1100 lb. pay load only 400 ft.) Best performance plane built with "Wasp" motor Buying new high speed planes is reason for selling Price $2,500.00 with approved skis Write for guaranteed condition and further details. Zimmerly Bros Air Transport, Lewiston Idaho No 18

PARKS AIR COLLEGE OFFERS—5 place J 5 Lockheed With or without newly overhauled J-5 engine Equipment includes Goodrich air wheels, speed ring, rate of climb, electric or hand inertia starter Licensed to 1938 Red Fuselage fin and rudder Diana cream wings stabilizer and elevators A bargain for quick disposal Write, wire or phone for further particulars Parks Air College, Inc East St Louis, Ill No 19

WACO CABIN 1934, Continental 225, Kollsman altimeter bank and turn, radio, 70 gallon gas tanks landing lights, flares, never cracked, privately owned 650 hours $3,250.00 Muncie Aviation Corp. Muncie Indiana No 20

SAVOIA MARCHETTI 5 hours since major new bottom and floor, new tires, new covering Heywood air starter, new pontoons, just relicensed, guarantee this ship to be in first class condition, or trades. Raymond V Green Fulton, N Y No 21

FOR SALE, WINGS: Waco F, Waco 10 J-5 J6-5 Waco Cabin, Aeronca, Travelair American Eagle We are equipped to rebuild any wing in 24 hours after it arrives at our factory N L Aircraft Company, Vermilion Ohio No 22

BK BIRD K 5 Front Exhaust Plane and Motor completely overhauled All Yellow Green curpe, hand rubbed finish streamline tailwheel generator, lights Hamilton propeller, brakes low pressure tires Wire or write for guaranteed condition Price $1,350.00. Zimmerly Bros Air Transport Lewiston Idaho No 23

WACO CABIN 1934, Jacobs motor, 750 hours motor recently modernized propeller reconditioned bank and turn rate of climb new RCA radio flares landing lights 70 gallon gas tanks completely recovered and refinished fifteen months ago $3,500.00 Muncie Aviation Corp. Muncie Indiana No 24

STINSON S 1932 model in perfect condition has only 260 hours since new. Price $1,850.00 Virgil C Fichter Municipal Airport, Quincy Ill No 25

FOR SALE Parts for Kinner Warner Velie etc engines Special prices on heads pistons valve guides and bushings Anything and everything for the airplane Write for quotations on your requirements Ames Aircraft Supply Co., Box 263, Niles Michigan No 26

CURTISS THRUSH, 6 place J6-7 Ship and motor in excellent condition $1,395.00 1937 Taylor Cub, dual ignition, tail wheel Special paint job, red and white Ship cannot be told from new $1,550.00 The Little Greiner Flying Service, Inc Municipal Airport, Springfield, Ohio No 27

K R 34 Comet 185 hp., 5 place, complete set of instruments less than 400 hours K R 21, Kinner, 100 hp less than 550 hours, GeeBee Model A just relicensed, Travelair Motor parts for Axelson OX LeBlond, Challenger Inertia starters, wings for an Eaglerock, and Waco Accessories Aviation Service Company Inc Hartford Conn No. 28

WACO, 5 place standard 1937, Jacobs 225, radio rate of climb turn and bank manifold pressure Cotter Reed prop Grimes retractable landing lights, flares, pants special upholstery special paint total time 140 hours, cost new $6,680. Fairchild 1937 Warner rate of climb bank and turn, thermo couple generator, like new Taylor Cub 1937, special paint ball bearing wheels large tires, winter enclosure cost new $1,570, price $1,050 No credit, phone or wire White Flying Service Inc , Caldwell, N J No 29

1 PRATT AND WHITNEY Wasp SC1 Motor completely overhauled according to factory specifications Starter carburetor and motor all for $1,250 or will trade for Warner Super Scarab '50 No time since overhaul on Wasp Zimmerly Bros Air Transport Lewiston Idaho. No 30

AERONCA C-3 1933 550 hours, brakes two doors, cabin heater, new propeller, $1,100.00. Muncie Aviation Corp., Muncie, Indiana. No 31

SLIGHTLY CRACKED Pitcairn, P A 6X less engine Make an offer Jersey Air Service Oakland, N J No 32

LATE 35 Cub enclosed, 440 hours never scratched, looks and flys like new Licensed to November 15, 1937 $800.00 Parkersburg Flying Service Parkersburg W Va No 33

WACO UIC 1933, radio flares lights, ambulance, $2,750, Challenger Commandaire $1,000 OX Robin just overhauled, $550 Wasp Fairchild 71 seaplane price on application Cracked Porterfield as is $400, LeBlonde 70 Klemm $600 damaged floats go with ship 1935 Porterfield $1,050, OX Travelair $425 New Cub airplanes trades accepted Terms as low as one-third down Airways, Inc Waterville Maine No 34

COMMANDAIRE—OX-5 excellent condition licensed Miller overhead, $300.00 Muncie Aviation Corp. Muncie, Indiana No 35

WASP 420 H P radial moderately used by Government—less plugs starters only—price ½ overhaul cost $250.00 Dycer Airport, 9401 So Western Los Angeles Calif No 36

AMERICAN EAGLE OX Perfect condition just relicensed $395.00. Can be financed Aero-Ways, Inc., Cleveland Airport Cleveland Ohio No 37

Continued from page 86

Vultee V-1A Transport
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Ten Place Planes with Wright Cyclone Engines; New and Used Planes Available

ENGINES

Manufacturer	Type	H P
Pratt & Whitney	Hornet (Geared)	575
Pratt & Whitney	Hornet	525
Pratt & Whitney	Wasp	450
Wright	J-6	300
Wright	J-5	225
Curtiss	D 12	435
Curtiss	Conqueror	600

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NC 15812 1936 BEECHCRAFT, 225 HP Jacobs motor Light blue black and red striping 74 gal gas capacity Turn & Bank, Rate of Climb, Thermocouple RCA Receiver Landing lights, Flares, Total time 446 hours 312 hours since motor major Excellent condition, beautiful finish [illegible]

NC 15846 1936 BEECHCRAFT, 285 HP Jacobs motor Dark blue with silver striping, 74 gal gas capacity Turn & Bank, Rate of Climb RCA Receiver Landing lights, Flares, Total time 420 hours excellent condition beautiful finish [illegible]

NC 16432 1936 BEECHCRAFT 225 HP Jacobs motor Dark blue yellow striping 74 gal gas capacity Turn & Bank, Rate of Climb, Landing lights, Flares, RCA Receiver Total time 216 hours. Excellent condition beautiful finish [illegible]

NC 16520 1936 WACO CUSTOM, 285 HP Wright motor Controllable propeller Turn & Bank Rate of Climb Flares Landing lights RCA Receiver Clock, Thermocouple Manifold pressure gauge Carburetor temperature gauge Certis proof tires special Diana cream with blue striping Beautifully finished throughout. Total time 38 hours. Like new $9,000.00

NC 800 W SIKORSKY S 39 AMPHIBIAN Pratt Whitney 450 HP motor Gray hull silver wings RCA Radio, Turn & Bank Rate of Climb, Long distance gas tanks, special streamline. Beautifully finished Total time since complete overhaul 868 hours $13,000.00

NC 16946 S-T A RYAN Built November 1936—145 HP Menasco motor This is the famous ship with the Adjustable Sliding Winter Enclosure Turn & Bank, Rate of Climb and Position lights new June 1937 Doral Cowling just installed Total time 181 hours. Brand new Hartzell propeller $4,000.00

NC 17390 S-T A RYAN November 1936, 125 HP Menasco motor All standard factory instruments including compass. ELECTRIC STARTER booster battery wired for lights Total time 126 hours. No time on engine since major overhaul Brand new Hartzell propeller $4,300.00

NC 465N J-6-7 TRAVELAIR C 4000, 3-place plus 25 pounds of baggage. Red fuselage silver wings blue striping oleo struts Brakes semi airwheels, special Oleo landing gear COMPLETLY EQUIPPED FOR SKYWRITING. Motor majored and converted to "D" with new pistons and cylinders just 30 hours ago. Steel propeller Licensed to February 1 1938 $1,600.00

Also the following parts for SIKORSKY S 42a

Set of Wings complete with ailerons set of Tail Booms, Horizontal Stabilizer Vertical Fin one Right Elevator all above parts uncovered. One right float complete with struts to hull one motor mount and ring and several miscellaneous struts, one rudder bar assembly

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Planes, Engines and Parts For Sale—Products—Services

(continued from pages 87 and 87)

LEBLOND 65 HP motor and prop. Motor perfect, 110h unused. Also combination ten-gallon gas and seven-quart oil tank all for $200 or sell separately. Stanley Morrison, 14500 Ardmore, Detroit, Michigan. No. 38

J-5 NOSE SPINNER, including magneto covers $20.00, exhaust ring, $50.00, speed ring, $40.00, Kruger exhaust manifold $35.00. Eagle Aircraft Specialties, Escondido, California. No. 39

BEECHCRAFT 225 Jacobs, 50 hours on engine, radio, landing lights, five place. Stinson vermillion and black. Clean fast ship. David Raub, Nantucket, Mass. No. 40

CHALLENGER OX5, fine condition, licensed to April 1938, sacrifice $350. Cash. M. C. Bradley, 135 So. Illinois Ave., Atlantic City, N. J. No. 41

Products

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KNOW Aircraft. Every type. Names, Dates, Records. 92 pictures. $1.00. Blandin Chara Co., Box 34, Los Angeles, Calif. No. 42

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Pontoons

PONTOONS FOR SALE. Edo Model 3850. Hunter Company, Shrine Bldg., Memphis, Tenn. No. 47

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Wanted

WANTED. For Cash used aeroplanes, cracked or otherwise, motors and parts. Aviation Service Co., Inc., Hartford, Conn. No. 50

WANTED. B-5 motor Kinner Complete or less heads. Pay cash. Tel. TY 9636. Harry H. Corley, 6626 Meck Avenue, Detroit, Michigan. No. 51

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U. S. Government

WAR DEPARTMENT, Materiel Division, Air Corps, Wright Field, Dayton, Ohio, Office of the Contracting Officer.—The War Department invites the submission on competition of sealed bids covering airplanes under conditions set forth more particularly in the following advertisements: Circular Proposal No. 37-650 dated June 24, 1937, Short Range Amphibian Type described in U. S. Army Specification No. 98-412 dated April 5, 1937, bids to be submitted to the Contracting Officer not later than 2:00 P.M. Eastern Standard time February 24, 1938—and Circular Proposal No. 37-740 dated June 24, 1937, Transport Cargo (two engined) Type described in U. S. Army Specification No. 98-308 dated April 1, 1937, bids to be submitted to Contracting Officer not later than 1:00 P.M. Eastern Standard Time December 20, 1937. Full particulars with respect to said advertisements may be obtained upon application to the Contracting Officer, Wright Field, Dayton, Ohio. R. W. Propst, Major, Air Corps, Contracting Officer.

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AV 8

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